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<110> Farnet, Chris
Zazopoulos, Emmanuel
Staffa, Alfredo

<120> GENE CLUSTER FOR RAMOPLANIN BIOSYNTHESIS

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<141> 2001-10-15

<150> US 60/239,924
<151> 2000-10-13

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Arg	Ala	His	Asp	Arg	Tyr	Gln	Ala	Gln	Cys	Ala	Ser	Ile	Gly	Asn	Cys		35	40	45	
Ala	Glu	Ala	Met	Leu	Gln	Phe	Gln	Asn	Asp	Phe	Arg	Thr	Arg	Leu	Leu		50	55	60	
Leu	Leu	Ala	Ile	Leu	Leu	Ala	Ala	Ile	Pro	Gly	Ile	Leu	Gly	Val	Phe		65	70	75	80
Trp	Gly	Ala	Pro	Leu	Val	Ala	Arg	Glu	Leu	Glu	Thr	Gly	Thr	His	Arg		85	90	95	
Leu	Val	Trp	Asn	Gln	Ser	Val	Thr	Arg	Arg	Arg	Trp	Leu	Ala	Val	Lys		100	105	110	
Val	Leu	Phe	Val	Gly	Val	Ala	Ala	Met	Ala	Val	Ala	Thr	Leu	Val	Ser		115	120	125	
Thr	Leu	Leu	Thr	Trp	Ala	Ser	Ser	Pro	Val	Asp	Ala	Val	Ser	Gln	Asp		130	135	140	
Arg	Phe	Gly	Ala	Leu	Val	Phe	Asp	Ala	Arg	Asn	Ile	Val	Pro	Val	Ala		145	150	155	160
Tyr	Ala	Ala	Phe	Ala	Leu	Val	Leu	Gly	Thr	Val	Ile	Gly	Leu	Leu	Val		165	170	175	
Arg	Arg	Thr	Ile	Pro	Ala	Met	Ala	Leu	Thr	Met	Leu	Val	Phe	Ala	Val		180	185	190	
Val	Gln	Phe	Thr	Val	Pro	Ala	Leu	Ala	Arg	Pro	His	Leu	Met	Ala	Pro		195	200	205	
Glu	Thr	Gln	Thr	Arg	Gln	Met	Thr	Leu	Gln	Glu	Phe	Gly	Glu	Val	Arg		210	215	220	
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Trp	Val	Thr	Ser	Thr	Ser	Pro	Leu	Leu	Thr	Ala	Asp	Gly	Thr	Arg	Leu		245	250	255	
Asp	Lys	Ala	Thr	Tyr	Arg	Lys	Cys	Val	Thr	Asp	Pro	Pro	Ala	Val	Ser		260	265	270	
Gly	Gly	Ala	Pro	Gly	Val	Gly	Gly	Thr	Val	Ala	Cys	Leu	Ala	Asp	Leu		275	280	285	
Asp	Leu	His	Val	Glu	Val	Ala	Tyr	Gln	Pro	Asn	Asp	Arg	Tyr	Trp	Thr		290	295	300	
Phe	Gln	Trp	Ile	Glu	Ser	Ala	Leu	Tyr	Leu	Ala	Leu	Gly	Gly	Leu	Leu		305	310	315	320

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 35 40 45
 Ser Thr Leu Leu Gln Leu Ala Cys Gly Leu Ile Thr Pro Ser Glu Gly
 50 55 60
 Ser Leu Arg Val Leu Gly Glu Thr Pro Ala Ala Asn Ala Gly His Leu
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 Ala Lys Val Gly Phe Val Ala Gln Asp Thr Pro Val Tyr Ser Asn Phe
 85 90 95
 Thr Val Gly Asp His Leu Lys Met Gly Ala Lys Leu Asn Pro Thr Trp
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 Asp Gln Ala Leu Ala Glu Arg Arg Val Ala Gln Val Gly Leu Asn His
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 Gly Gln Lys Ala Gly Arg Leu Ser Gly Gly Gln Arg Ala Gln Leu Ala
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 Leu Thr Leu Ala Ala Ala Lys Arg Pro Glu Leu Leu Met Phe Asp Glu
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 Pro Ala Ala Ala Leu Asp Pro Leu Ala Arg Asp Gly Phe Leu Gln Asn
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 Leu Leu Glu Phe Val Thr Glu Leu Asp Ala Ser Ala Ile Leu Ser Ser
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 His Leu Leu Gly Asp Val Glu Arg Val Cys Asn Tyr Leu Ile Val Leu
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 Cys Ala Ser Arg Val Gln Val Ala Gly Asp Val Pro Asp Leu Leu Asn
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 Thr His Tyr Arg Ile Val Ala Pro Arg Gly Glu Leu Asp His Pro Pro
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 Ala Gly Leu Glu Val Ile Arg Ala Gln His Ala Asp Arg Tyr Thr Thr
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 Ala Val Val Arg Gly Asp Gly Ser Arg Pro Ser Thr Trp Thr Ile Glu
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Gly Val Thr Gly Glu Pro Leu Met Ala Ala Ser Gly Glu Val Val Arg
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 35 40 45

Ala Gly Pro Leu Gly Gln Phe Ser Leu Asp Tyr Glu Asn Thr Leu Leu
 50 55 60

Tyr Leu Ala Gly Val Leu Ala Leu Val Pro Gly Leu Leu Gly Met Phe
 65 70 75 80

Trp Gly Ala Pro Leu Ile Thr Arg Glu Leu Glu Asn Gly Thr Gln Arg
 85 90 95

Leu Val Trp Asn Gln Ser Val Thr Arg Arg Arg Trp Leu Leu Ile Lys
 100 105 110

Leu Leu Val Val Gly Leu Ala Cys Met Val Val Ala Gly Val Pro Ser
 115 120 125

Leu Leu Leu Thr Trp Ala Ala Ala Pro Val Asp Asn Val Ala Asp Asn
 130 135 140

Arg Phe Ser Thr Val Met Phe Gly Ala Arg Phe Leu Pro Pro Ile Ala
 145 150 155 160

Tyr Ala Ala Phe Ala Phe Val Leu Gly Thr Leu Ile Gly Leu Leu Val
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Arg Arg Thr Val Pro Ala Met Ala Leu Thr Leu Val Ala Phe Val Ile
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Phe Gln Phe Leu Val Pro Asn Leu Val Arg Pro His Leu Met Pro Ala
 195 200 205

Lys His Leu Val Lys Pro Met Thr Val Ser Ala Ile Asn Glu Ala Lys
 210 215 220

Ser Leu Gly Ser Ile Thr Gly Ala Pro Val Leu Asn Gly Leu Ser Ile
 225 230 235 240

Ser Gln Gly Trp Ile Thr Asp Val Ser Ala Leu Lys Thr Ala Asp Gly

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Arg	Ser	Leu	Asp	Ala	Lys	Thr	Phe	Asp	Asn	Cys	Tyr	Met	Asn	Ala	Pro				
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Lys	Thr	Gly	Ala	Thr	Glu	Gly	Pro	Tyr	Gly	Asp	Val	Ala	Val	Cys	Leu				
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 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will contain a methionineresidue at t
 his position

<400> 5

Val	Arg	Ser	Ala	Val	Val	Val	Gly	Thr	Gly	Leu	Ile	Gly	Thr	Ser	Val				
1				5					10					15					
Gly	Leu	Ala	Leu	Thr	Gln	Arg	Asp	Ile	Thr	Val	His	Leu	Leu	Asp	Ala				
			20				25						30						
Asp	Pro	Ala	Ala	Ala	Arg	Ala	Ala	Ala	Ala	Leu	Gly	Ala	Gly	Ile	Ala				
		35				40						45							
Gly	Glu	Pro	Arg	Thr	Arg	Val	Asp	Val	Ala	Val	Ile	Ala	Val	Pro	Pro				
	50					55					60								
Ala	Ala	Val	Ala	Pro	Val	Leu	Ala	Asp	Leu	Gln	Arg	Arg	Gly	Thr	Ala				
65					70				75					80					
Arg	Val	His	Thr	Asp	Ala	Ala	Ser	Val	Lys	Val	Leu	Pro	Ser	Arg	Gln				
			85					90						95					
Ile	Glu	Val	Leu	Gly	Cys	Asp	Ala	Ser	Ser	His	Val	Gly	Gly	His	Pro				
		100					105						110						
Leu	Ala	Gly	Ser	Glu	Arg	Ser	Gly	Pro	His	Ala	Ala	Arg	Gly	Ser	Leu				
		115					120					125							
Phe	Glu	Gly	Arg	Pro	Trp	Val	Leu	Ser	Pro	Gly	Arg	Arg	Ser	Ser	Thr				
	130					135					140								
Ala	Ala	Val	Asp	Gly	Ala	Leu	Ala	Val	Val	Ser	Ala	Cys	Gly	Ala	Thr				

145		150		155		160
Pro Val Leu Met Ser	Ala Glu Glu His Asp Arg Ala Val Ala Leu Val					
	165		170			175
Ser His Val Pro His Leu Val Ala Gly Leu Leu Ala Ala Arg Met Leu						
	180		185			190
Asp Gly Thr Pro Ala Gln Leu Gly Leu Ala Gly Gln Gly Val Arg Asp						
	195		200			205
Thr Thr Arg Ile Ala Gly Gly Arg Ala Ala Leu Trp Thr Glu Ile Leu						
	210		215			220
Ala Ala Asn Ala Gly Ala Val Ala Asp Val Leu Asp Asp Leu Ser Ala						
	225		230		235	240
Glu Leu Ala Ala Thr Ile Ser Ala Leu Arg Glu Leu Glu Ala His Pro						
	245		250			255
Gly Arg Ala Glu Ala Leu Ala Ala Leu Thr Gly Met Leu Gln Arg Gly						
	260		265			270
Val Asp Gly Arg Asp Arg Ile Ala Ala Ser Pro						
	275		280			

<210> 6
 <211> 336
 <212> PRT
 <213> Actinoplanes sp.

<400> 6

Met Glu Ser Leu His Ile Ala Ser Ala Arg His Glu Pro Asp Arg His														
1		5					10					15		
Asp Glu Thr Gln Met Asn Thr Pro Ser Met Met Arg Val Glu Trp Leu														
	20						25					30		
Pro Val Asp Ser Leu Glu Met Leu Asp Ser Pro Arg Leu Ala Gly Glu														
	35						40					45		
Asp Pro Arg His Thr Gln Met Leu Ala Ser Leu Asp Ala Glu Leu Pro														
	50					55				60				
Pro Ile Ile Val His Arg Ala Ser Met Arg Val Ile Asp Gly Ala His														
	65				70				75					80
Arg Leu Gly Ala Ala Arg Leu Arg Gly Asp Glu Leu Ile Lys Ala Ala														
			85					90					95	
Met Phe Glu Gly Ser Glu Gln Glu Ala Phe Val Leu Gly Val Lys Ala														
	100						105					110		
Asn Ile Ala His Gly Leu Pro Leu Ser Thr Ala Asp Arg Thr Arg Ala														
	115						120				125			
Ala Glu Arg Ile Ile Glu Ser His Pro Ser Trp Ser Asp Arg Thr Ile														
	130					135					140			

Ala Ala Ser Ser Gly Leu Ser Ala Arg Thr Val Gly Asn Ile Arg Arg
 145 150 155 , 160
 Arg Leu Glu Leu Ser Gly Asp Ile Gly Gln Gly Ser Arg Thr Arg Val
 165 170 175
 Gly Arg Asp Gly Arg Val Arg Pro Leu Asp Asn Ser Glu Gly Arg Leu
 180 185 190
 Lys Ala Val Ser Tyr Ile Gln Gln Gln Pro Asp Ala Ser Leu Arg Glu
 195 200 205
 Ile Ala Lys Asn Ala Gly Val Ser Pro Ser Thr Ala Arg Asp Val Arg
 210 215 220
 Asn Arg Leu Gln Arg Gly Glu Asp Pro Leu Pro Gly Pro Arg Arg Thr
 225 230 235 240
 Gly Gly His Arg Asp Asp Ile Ser Phe Asp Lys Glu Asn Thr Ile Arg
 245 250 255
 Leu Leu Glu Pro Thr Val Arg Ser Ile Leu Gln Gly Leu Lys Asn Asp
 260 265 270
 Pro Ser Leu Arg Phe Thr Glu Ser Gly Arg Asn Leu Leu Arg Trp Val
 275 280 285
 Leu Ala Arg Thr Val Gln Asp Asp Glu Trp Lys Asp Met Leu Asp Ala
 290 295 300
 Val Pro Ser His Cys Thr Tyr Val Leu Ala Asn Val Ala Arg Arg Cys
 305 310 315 320
 Ser Gln Glu Trp Leu Glu Phe Ala Glu Thr Leu Glu Lys Asn Ala Ala
 325 330 335

<210> 7
 <211> 444
 <212> PRT
 <213> Actinoplanes sp.

<400> 7

Met Ser Ile Leu Arg Glu Ala Pro Gly Thr Gly Arg Val Leu Arg Arg
 1 5 10 15
 Glu Asp Leu His Gln Ser Leu Ser Asp Pro Leu Leu Asp Thr Met Asn
 20 25 30
 Phe Leu Asn Glu Val Thr Ala Arg Tyr Pro Arg Ala Val Ser Phe Ala
 35 40 45
 Pro Gly Arg Pro Phe Asp Gly Phe Phe Asp Val Glu Gln Ile Phe Arg
 50 55 60
 Gly Ile Arg Gly Tyr Leu Glu His Leu Ala Gly Gln Gly Arg Ser Pro
 65 70 75 80
 Ala Glu Ile Arg Asp Ala Val Phe Gln Tyr Gly Pro Ala Ala Gly Arg
 85 90 95

Ile	Arg	Glu	Val	Ile	Ala	Gln	Trp	Leu	Arg	Arg	Asp	Glu	Gly	Ile	Asp		
			100					105					110				
Val	Ala	Pro	Glu	Ser	Ile	Val	Val	Thr	Val	Gly	Ala	Gln	Glu	Ala	Met		
		115					120					125					
Leu	Leu	Ala	Leu	Arg	Ala	Leu	Ile	Arg	Asp	Glu	Arg	Asp	Ala	Leu	Phe		
	130					135					140						
Val	Ala	Ser	Pro	Cys	Tyr	Val	Gly	Ile	Thr	Gly	Ala	Ala	Arg	Leu	Leu		
145					150					155					160		
Asp	Ile	Asp	Pro	Val	Pro	Val	Ala	Glu	Arg	Glu	Asp	Gly	Phe	His	Pro		
				165					170					175			
Glu	Asp	Leu	Ala	Arg	Ala	Val	His	Ala	Glu	Leu	Ser	Arg	Gly	Arg	Arg		
			180					185					190				
Pro	Arg	Ala	Phe	Tyr	Val	Val	Pro	Asp	His	Thr	Asn	Pro	Ser	Gly	Ala		
		195					200					205					
Thr	Met	Pro	Leu	Glu	Ala	Arg	His	Ala	Leu	Leu	Asp	Leu	Ala	Gly	Glu		
	210					215					220						
Leu	Gly	Leu	Leu	Val	Ile	Glu	Asp	Ser	Pro	Tyr	Arg	Leu	Val	Ser	Pro		
225					230					235					240		
Gly	Gln	Gln	Leu	Pro	Ser	Leu	Lys	Ala	Leu	Asp	Pro	Gly	Arg	His	Val		
				245					250					255			
Val	His	Leu	Gly	Ser	Phe	Ser	Lys	Thr	Leu	Phe	Pro	Gly	Ala	Arg	Val		
			260					265					270				
Gly	Phe	Ala	Ile	Ala	Asp	Gln	Pro	Val	Ser	Asp	Ala	Ala	Gly	Gly	Ala		
		275					280					285					
Gly	Leu	Leu	Ala	Asp	Glu	Leu	Ala	Lys	Val	Lys	Ser	Met	Val	Thr	Val		
	290					295					300						
Asn	Thr	Ser	Pro	Leu	Ser	Gln	Ala	Ala	Val	Ala	Gly	Met	Leu	Leu	Ala		
305					310					315					320		
Ala	Gly	Gly	Thr	Ala	Ala	Glu	Ala	Ser	Ala	Glu	Ser	Ser	Ala	His	Tyr		
				325					330					335			
Gly	Ala	Ala	Met	Arg	Arg	Thr	Leu	Asp	Arg	Leu	Glu	Glu	His	Leu	Pro		
			340					345					350				
Ala	Ser	Phe	Arg	Ala	Arg	Thr	Gly	Val	Arg	Trp	Asn	Arg	Pro	Ser	Gly		
		355					360					365					
Gly	Phe	Phe	Leu	Ala	Val	Asn	Val	Pro	Phe	Thr	Ala	Asp	Asn	Ala	Ala		
	370					375					380						
Leu	Ser	Arg	Ser	Ala	Glu	Asp	His	Gly	Val	Ile	Trp	Thr	Pro	Met	Ser		
385					390					395					400		
Tyr	Phe	Tyr	Pro	Ala	Gly	Gly	Gly	Glu	Gln	Gly	Ile	Arg	Leu	Ser	Ile		
				405					410					415			

Ser Tyr Leu Thr Pro Glu Glu Ile Asp Glu Gly Val Lys Arg Leu Ala
420 425 430

Gly Phe Ile Thr Thr Glu Ile Ala Ala Leu Arg Pro
435 440

<210> 8

<211> 356

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that
the biosynthesized protein will have a formylmethionine residue
at this position

<400> 8

Val Thr Ala Thr Ala Leu Leu Pro Leu Thr Leu Ala Asp Tyr Glu Gln
1 5 10 15

Leu Ala Gln Ala Arg Met Glu Pro Pro Val Trp Asp Phe Ile Ala Gly
20 25 30

Gly Ala Gly Glu Glu Leu Thr Leu Ala Ala Asn Thr Ala Ala Phe Ala
35 40 45

Pro Pro Arg Leu Arg Pro Arg Val Leu Thr Gly Ala Gly Ala Pro Asp
50 55 60

Thr Gly Thr Thr Ile Leu Gly Arg Arg Trp Ala Ala Pro Ile Gly Val
65 70 75 80

Ala Pro Leu Gly Tyr His Thr Leu Val Asp Pro Ala Gly Glu Val Ala
85 90 95

Thr Ala Ala Ala Ala Gly Ala Ala Gly Leu Pro Leu Val Val Ser Thr
100 105 110

Phe Ser Gly Arg Thr Val Glu Asp Ile Ala Ala Ala Thr Thr Ala Pro
115 120 125

Arg Trp Leu Gln Val Tyr Cys Phe Arg Asp Arg Ala Val Thr Ala Ala
130 135 140

Leu Val Thr Arg Ala Val Arg Ala Gly Phe Glu Ala Leu Val Leu Thr
145 150 155 160

Val Asp Ala Pro Arg Leu Gly Arg Arg Leu Arg Asp Ile Arg Asn Asp
165 170 175

Phe Arg Leu Pro Pro Gly Val Ala Pro Ala Asn Leu Thr Gly Asp Gly
180 185 190

Phe Ala Ser Pro Ser Gly His Ala Leu Gly Ala Phe Asp Ala Ala Met
195 200 205

Asp Trp Thr Val Val Ala Trp Leu Arg Glu Leu Ser Gly Leu Pro Val
 210 215 220
 Leu Leu Lys Gly Val Leu Thr Ala Asp Gly Ala Arg Arg Ala Leu Asp
 225 230 235 240
 Ala Gly Ala Asp Gly Ile Val Val Ser Asn His Gly Gly Arg Gln Leu
 245 250 255
 Asp Gly Val Pro Ala Thr Leu Asp Val Leu Pro Glu Val Val Ala Ala
 260 265 270
 Val Ala Gly Arg Cys Pro Val Leu Leu Asp Gly Gly Val Arg Arg Gly
 275 280 285
 Arg Asp Val Leu Leu Ser Leu Ala Leu Gly Ala Asp Ala Val Leu Val
 290 295 300
 Gly Arg Pro Val Leu Tyr Gly Leu Ala Val Gly Gly Thr Ala Gly Val
 305 310 315 320
 Arg His Val Leu Asp Ile Leu Ala Gly Glu Leu Thr Asp Asp Met Ala
 325 330 335
 Leu Ala Gly Val Ala Ser Pro Ala Asp Ala Gly Ala Asp Leu Ala Gly
 340 345 350
 Pro Val Ala Pro
 355

<210> 9
 <211> 640
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine at this
 position

<400> 9

Val Ala Thr Ile Asp Gly Pro Asp Leu Gly Val Ile Gly Leu Arg Val
 1 5 10 15
 Asp Gly Leu Ile Pro Met Gln Lys Val Arg Pro Gly Thr Val Arg Arg
 20 25 30
 Ile Leu Pro Tyr Ala Lys Lys His Arg Trp Ser Leu Ala Val Ala Leu
 35 40 45
 Leu Met Thr Val Val Asp Ala Ala Leu Thr Val Ala Asn Pro Leu Leu
 50 55 60
 Leu Lys Gln Ile Ile Asp Arg Gly Ile Val Ala Gly Arg Leu Asp Val
 65 70 75 80

Val	Val	Gly	Leu	Ser	Leu	Val	Val	Ala	Gly	Leu	Ala	Leu	Val	Asn	Val		
				85					90					95			
Ala	Ala	Ile	His	Val	Gln	Thr	Leu	Ala	Ser	Gly	Arg	Val	Gly	Gln	Gly		
			100					105					110				
Leu	Ile	Tyr	Asp	Leu	Arg	Thr	Lys	Val	Phe	Ala	His	Val	Met	Arg	Gln		
		115					120					125					
Pro	Leu	Ala	Phe	Phe	Thr	Arg	Ala	Gln	Thr	Gly	Ser	Leu	Val	Ser	Arg		
	130					135					140						
Leu	Asn	Thr	Asp	Val	Val	Gly	Ala	Glu	Gln	Ala	Met	Thr	Ser	Met	Ile		
145					150					155					160		
Thr	Gln	Thr	Val	Ser	Thr	Val	Leu	Thr	Val	Val	Leu	Val	Ile	Gly	Ala		
			165					170						175			
Met	Phe	Tyr	Leu	Ser	Trp	Ala	Ile	Ala	Leu	Val	Ala	Leu	Val	Leu	Ile		
			180					185					190				
Pro	Leu	Phe	Phe	Leu	Pro	Gly	Lys	Leu	Ile	Ala	Gly	Arg	Leu	Glu	Arg		
	195					200						205					
Leu	Ala	Arg	Gly	Gly	Met	Gln	Val	Asp	Ala	Glu	Leu	Gly	Ser	Met	Met		
	210					215					220						
Asn	Glu	Arg	Phe	Asn	Val	Ser	Gly	Ala	Met	Leu	Val	Lys	Leu	Tyr	Gly		
225					230					235					240		
Arg	Pro	Glu	Ser	Glu	Glu	Thr	Ala	Phe	Ala	Gly	Arg	Ala	Ala	Arg	Val		
				245					250					255			
Arg	Asp	Ile	Ala	Ile	Ser	Met	Gly	Val	His	Ala	Arg	Leu	Leu	Phe	Ile		
			260					265					270				
Ile	Ala	Thr	Leu	Leu	Thr	Thr	Val	Thr	Thr	Ala	Met	Val	Tyr	Gly	Phe		
		275					280					285					
Gly	Gly	Ala	Leu	Val	Ile	Asp	Gly	Thr	Leu	Gly	Ile	Gly	Thr	Leu	Val		
	290					295					300						
Ala	Met	Val	Ala	Leu	Leu	Ala	Gln	Leu	Tyr	Gly	Pro	Val	Asn	Gln	Leu		
305					310					315					320		
Thr	Asn	Ile	Gln	Val	Asp	Val	Val	Thr	Ala	Leu	Val	Ser	Phe	Asp	Arg		
			325					330						335			
Val	Phe	Glu	Val	Leu	Asp	Leu	Asp	Pro	Leu	Val	Lys	Glu	Arg	Pro	Gly		
			340					345					350				
Ala	Arg	Ala	Leu	Pro	Ala	Ala	Glu	Pro	Gly	Arg	Ser	Ala	Ala	Pro	Asp		
		355					360					365					
Ile	Glu	Phe	Asp	Asn	Val	Val	Phe	Arg	Tyr	Pro	Gly	Ala	Asp	Glu	Val		
	370					375					380						
Ser	Leu	Ala	Ser	Leu	Glu	Thr	Val	Ala	Gln	Arg	Ser	Ser	Asp	Gly	Thr		
385					390					395					400		

Ala Glu Arg Pro Val Leu Asn Gly Ile Ser Phe Leu Ala Pro Ala Gly
 405 410 415
 Lys Leu Thr Ala Leu Val Gly Pro Ser Gly Ala Gly Lys Thr Thr Ile
 420 425 430
 Thr His Leu Val Pro Arg Leu Tyr Asp Thr Thr Ser Gly Thr Val Arg
 435 440 445
 Ile Ala Gly His Asp Val Arg Asp Leu Thr Leu Arg Ser Leu Ser Glu
 450 455 460
 Ser Ile Gly Val Val Thr Gln Asp Ala His Leu Phe His Asp Thr Ile
 465 470 475 480
 Arg Ala Asn Leu Leu Tyr Gly Arg Pro Asp Ala Gly Glu Arg Asp Leu
 485 490 495
 Val Ala Ala Cys Glu Ala Ala Arg Ile Trp Glu Met Val Ser Ser Leu
 500 505 510
 Pro Asp Gly Leu Asp Thr Val Val Gly Asp Arg Gly Tyr Arg Leu Ser
 515 520 525
 Gly Gly Glu Lys Gln Arg Leu Ala Leu Ala Arg Leu Leu Leu Lys Ser
 530 535 540
 Pro Pro Val Val Val Leu Asp Glu Ala Thr Ala His Leu Asp Ser Glu
 545 550 555 560
 Ser Glu Ala Ala Ile Gln Arg Ala Leu Asp Thr Ala Leu Ala Gly Arg
 565 570 575
 Thr Ser Leu Val Ile Ala His Arg Leu Ala Thr Ile Leu Asp Ala Asp
 580 585 590
 Gln Ile Leu Val Ile Asp Asp Gly Arg Val Val Glu Arg Gly Thr His
 595 600 605
 Asp Glu Leu Ile Ala His Gly Gly Leu Tyr Ala Glu Leu Tyr Arg Thr
 610 615 620
 Gln Phe Ala Gly Gln Arg Thr Glu Glu Arg Gln Pro Ala Val Pro Ser
 625 630 635 640

<210> 10

<211> 271

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 10

Val	Ser	Ala	Ala	Gly	Ser	Gly	Phe	Val	Thr	Thr	Asn	Gly	Val	Arg	Leu	1	5	10	15
Ala	Tyr	Arg	Arg	Ser	Gly	Ala	Gly	Glu	Pro	Val	Leu	Met	Ile	Met	Gly	20	25	30	
Ser	Gly	Ser	Ala	Gly	Gln	Thr	Trp	Thr	Val	His	Gln	Thr	Pro	Ala	Leu	35	40	45	
His	Glu	Ala	Gly	Tyr	Ser	Thr	Val	Val	Phe	Asp	Ser	Arg	Gly	Ile	Pro	50	55	60	
Pro	Ser	Asp	Val	Pro	Ala	Gly	Lys	Tyr	Ser	Leu	Ala	Asp	Met	Thr	Ala	65	70	75	80
Asp	Thr	Arg	Gly	Leu	Ile	Glu	Ala	Leu	Asp	Leu	Ala	Pro	Cys	Arg	Ile	85	90	95	
Val	Gly	Thr	Ser	Leu	Gly	Ala	Met	Ile	Ala	Gln	Glu	Leu	Ala	Val	Asp	100	105	110	
His	Pro	Glu	Leu	Val	Arg	Cys	Ala	Val	Leu	Ile	Ala	Thr	Leu	Ala	Arg	115	120	125	
Pro	Asp	Ala	Ala	Arg	Ala	Ala	Gln	Asn	Gln	Ala	Asp	Ile	Asp	Leu	Leu	130	135	140	
Glu	Ser	Gly	Val	Thr	Leu	Pro	Ala	Ala	Tyr	Glu	Ala	Ala	Thr	Ala	Val	145	150	155	160
Phe	Lys	Met	Phe	Ser	Pro	Ala	Thr	Leu	Asn	Asp	Asp	Val	Ala	Val	Arg	165	170	175	
Glu	Trp	Leu	Asp	Ile	Phe	Glu	Leu	Ser	Gly	Thr	Gly	Val	Ser	Ala	Gly	180	185	190	
Gly	Gln	Ala	Trp	Ala	Glu	Leu	Thr	Gly	Asp	Arg	Arg	Ala	Ala	Leu	Arg	195	200	205	
Ser	Val	Thr	Ala	Pro	Cys	Arg	Val	Ile	Ser	Phe	Ala	Asp	Asp	Leu	Ile	210	215	220	
Thr	Pro	Pro	His	Leu	Ala	Ala	Glu	Val	Ala	Glu	Ala	Ile	Pro	Asp	Cys	225	230	235	240
Asp	Leu	Val	Glu	Ile	Ser	Arg	Cys	Gly	His	Leu	Gly	Tyr	Leu	Glu	Arg	245	250	255	
Pro	Asp	Ala	Val	Asn	Ala	Ala	Ile	Leu	Glu	Phe	Leu	Asp	Ser	His	260	265	270		

<210> 11

<211> 529

<212> PRT

<213> Actinoplanes sp.

<400> 11

Met Gly Asn Ala Asp Gln Pro Arg Tyr Leu Arg Ser Asn Val Ile Ala

1	5	10	15
Glu Pro Leu Val Asp Arg Phe Tyr Ala Trp Leu His Thr Val Ala Pro	20	25	30
Val Pro Ala Ser Met Asn Leu Ala Phe Leu Gln Val Pro Leu Leu Glu	35	40	45
Ser Tyr Leu Gln Ser Pro Pro Val His Val Ala Ala Ser Thr Asn Pro	50	55	60
Lys Met Arg Gly Gly Tyr Phe Val Ala Val Glu Glu Ser Arg Ser Asp	65	70	75
Glu Val Ala Glu Leu Leu Lys Thr Ile Lys Asn Glu Arg Ala Asp Met	85	90	95
Leu Gly Phe Ala Ala Ala Val Ala Glu Ala Glu Asp Leu Ile Arg Glu	100	105	110
Asn Ala Val Gly Tyr Asp Leu Thr Pro Leu Tyr Pro Arg Leu Pro Ala	115	120	125
Ala Leu Asn Gly Leu Val Glu Ile Ala Tyr Asp Thr Ser Asn Gln Pro	130	135	140
Ser Leu His Phe Leu Glu Pro Leu Leu Tyr Arg Ser Pro Ala Tyr Asp	145	150	155
Glu Arg Arg Gln Ser Val Gln Leu Ser Leu Asp Asp Gly Val Glu Arg	165	170	175
Pro Phe Ile Leu Ser Thr Pro Arg Leu Pro Arg Ala Gly Val Leu Asp	180	185	190
Leu Pro Leu Pro Leu Arg His Pro Gly Leu Thr Glu Leu Phe Asp Ala	195	200	205
Arg Val Arg Pro Thr Ser Leu Asn Arg Leu Arg Glu Ala Leu Glu Leu	210	215	220
Asp Asp Ala Gly Ala Ala Ala Leu Asp Ala Leu Leu Thr Asp Glu Pro	225	230	235
Ser Leu Ser Pro Asp Arg His Ile Glu Ser Gly Gly Arg Val Arg Tyr	245	250	255
Tyr Gly His Ala Cys Val Val Met Gln Thr Glu Gln Ala Ala Val Val	260	265	270
Thr Asp Pro Phe Ile Ser Thr Asp Asn Arg His Gly Asp Arg Tyr Thr	275	280	285
Leu Asp Asp Leu Pro Asp His Ile Asp Leu Val Leu Ile Thr His Gly	290	295	300
His Gln Asp His Ile Val Leu Glu Thr Leu Leu Gln Leu Arg Gly Arg	305	310	315
Ile Gly Thr Val Val Val Pro Arg Thr Ser Arg Gly Asn Leu Pro Asp			

325										330					335				
Pro	Ser	Ile	Ala	Leu	Tyr	Leu	Arg	Arg	Ile	Gly	Phe	Thr	Val	Val	Glu				
			340					345					350						
Val	Glu	Glu	Phe	Asp	Glu	Val	Pro	Phe	Pro	Gly	Gly	Thr	Val	Thr	Ala				
		355					360					365							
Thr	Pro	Phe	Leu	Gly	Glu	His	Ala	Asp	Leu	Asp	Ile	Arg	Gly	Lys	Ser				
	370					375					380								
Thr	Tyr	Phe	Val	Arg	Met	Ala	Gly	Arg	Thr	Ile	Phe	Ile	Gly	Ala	Asp				
385					390					395					400				
Ser	Ser	Gly	Ile	Asp	Pro	Val	Leu	Tyr	Arg	Tyr	Ile	Arg	Asp	His	Val				
				405					410					415					
Gly	Gln	Val	Asp	Met	Ala	Phe	Leu	Gly	Met	Glu	Cys	Asp	Gly	Ala	Pro				
			420					425					430						
Leu	Asn	Trp	Leu	Tyr	Lys	Gly	Leu	Leu	Thr	Lys	Pro	Val	Asn	Lys	Lys				
		435					440					445							
Met	Ser	Ala	Ser	Arg	Arg	Leu	Ser	Gly	Ser	Asn	Ala	Glu	Gln	Ala	Gly				
	450					455					460								
Ala	Ile	Met	Thr	Glu	Leu	Gly	Ala	Thr	Ala	Gly	Tyr	Ile	Tyr	Ala	Met				
465					470					475					480				
Gly	Glu	Glu	Ser	Trp	Gln	Gly	His	Val	Met	Ala	Thr	Thr	Tyr	Asn	Glu				
				485					490					495					
Asp	Thr	Tyr	Gln	Leu	Lys	Gln	Ile	Asp	Glu	Phe	Leu	Ala	Trp	Cys	Ala				
			500					505					510						
Asp	Arg	Gly	Phe	Thr	Ala	Glu	His	Leu	Phe	Asn	Lys	Arg	Glu	Trp	Arg				
		515					520					525							

Trp

<210> 12
 <211> 90
 <212> PRT
 <213> Actinoplanes sp.

<400> 12

Met	Ser	Glu	Thr	Asp	Leu	Ser	Ala	Ala	Arg	His	Thr	Pro	Glu	Gln	Ile			
1				5					10					15				
Arg	Ser	Trp	Leu	Ile	Asp	Arg	Ile	Ala	Tyr	Tyr	Val	Met	Leu	Pro	Thr			
			20					25					30					
Gln	Glu	Ile	Glu	Pro	Asp	Val	Ser	Leu	Ala	Glu	Tyr	Gly	Leu	Asp	Ser			
		35					40					45						
Val	Tyr	Ala	Phe	Ala	Leu	Cys	Gly	Glu	Ile	Glu	Asp	Thr	Leu	Gly	Ile			
	50					55					60							

Pro Ile Glu Pro Thr Leu Leu Trp Asp Val Asp Thr Val Ala Thr Leu
65 70 75 80

Thr Ala His Leu Ala Asp Arg Val Asn Arg
85 90

<210> 13
<211> 1051
<212> PRT
<213> Actinoplanes sp.

<220>
<221> misc_feature
<222> (1)..(1)
<223> V represents a non-standard codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 13

Val Pro Thr Pro Asp Leu Arg Pro Leu Thr Pro Ala Gln Leu Ala Val
1 5 10 15

Trp His Ala Gln Gln Leu Ala Pro His Ser Pro Val Tyr Gln Val Gly
20 25 30

Glu Phe Val Glu Ile Asp Gly Glu Cys Asp Pro Asp Leu Leu Val Ala
35 40 45

Ala Leu Arg Gln Val Met Gly Glu Ala Glu Ser Ala Arg Leu Arg Phe
50 55 60

Arg Val Ile Asp Gly Thr Pro Trp Gln Tyr Val Ala Glu Asp Gly Asp
65 70 75 80

Asp Pro Ile Gln Val Val Asp Leu Gly Ala Ala Ala Asp Pro Arg Ala
85 90 95

Ala Ala Leu Gly Arg Met Ala Ala Asp Leu Asp Arg Pro Gly Asp Leu
100 105 110

Arg Asp Gly Pro Leu Val Glu His His Val Tyr Leu Leu Gly Glu Gly
115 120 125

Arg Val Ile Trp Tyr His Arg Ala His His Ile Val Cys Asp Gly Gly
130 135 140

Ser Leu Gly Ile Val Ala Ser Arg Val Ala Gly Val Tyr Ser Ala Leu
145 150 155 160

Ala Ala Gly Gly Asp Val Arg Pro Gly Ala Leu Pro Pro Leu Ser Val
165 170 175

Leu Leu Ser Ala Ala Asp Ala Tyr Glu Arg Ser Gly Asp Arg Asp Arg
180 185 190

Asp Arg Glu His Trp Arg Ser Ala Leu Ala Gly Leu Pro Ala Glu Leu
195 200 205

Leu Ala Gly Ala Gly Arg Pro Arg Pro Leu Pro Gly Pro Pro Val Arg
 210 215 220
 His Glu His Asp Leu Ser Ala Ala Glu Ala Gly Arg Leu Arg Ala Gly
 225 230 235 240
 Ala Arg Arg Leu Arg Thr Ser Val Ala Gln Ala Gly Ile Ala Ala Ala
 245 250 255
 Ala Leu Tyr Gln His Arg Leu Thr Gly Ala Arg Asp Val Leu Val Ala
 260 265 270
 Val Pro Val Ala Gly Arg Thr Thr Arg Pro Glu Phe Asp Val Pro Gly
 275 280 285
 Met Thr Ser Asn Val Val Pro Val Arg Leu Ala Val Thr Pro Ala Thr
 290 295 300
 Thr Val Gly Glu Leu Leu Arg Asp Val Ala Arg Gly Val Arg Asp Gly
 305 310 315 320
 Leu Arg His Gln Arg Tyr Pro Tyr Pro Asn Ile Val Asp Asp Leu Gly
 325 330 335
 Leu Ala Asp Arg Ala Ala Leu Arg Pro Val Thr Val Asn Ala Leu Ala
 340 345 350
 Leu Gly Arg Pro Leu Arg Phe Gly Ser Ala Val Gly Val Arg Ser Gly
 355 360 365
 Leu Ser Ala Gly Pro Val Asp Asp Val Thr Ile Gly Leu Tyr Glu Lys
 370 375 380
 Val Ser Gly Gly Gly Met Gln Thr Ile Ala Glu Leu Asn Pro Gly Arg
 385 390 395 400
 Thr Asp Arg Pro Asp Ala Ala Glu Val Ser Arg Trp Phe Arg Thr Leu
 405 410 415
 Leu Arg Gly Leu Ala Glu Ser Asp Ala Gly Asp Pro Val Ala Arg Ile
 420 425 430
 Asp Ile Val Asp Glu Pro Glu Arg Arg Arg Leu Leu Asp Glu Trp Asn
 435 440 445
 Ala Thr Ala Ala Pro Ser Ser Asp Thr Val Leu Ala Arg Phe Glu Glu
 450 455 460
 Gln Ala Ala Arg Thr Pro Glu Ala Pro Ala Val Val Cys Gly Asp Val
 465 470 475 480
 Thr Val Thr Tyr Ala Glu Leu Glu Ala Gly Ala Asn Arg Leu Ala Arg
 485 490 495
 Val Leu Arg Ala Arg Gly Ala Gly Pro Glu Ser Val Val Ala Leu Cys
 500 505 510
 Leu Pro Arg Gly Pro Glu Val Val Thr Gly Ile Leu Ala Ala Trp Lys
 515 520 525

Ala	Gly	Ala	Ala	Tyr	Leu	Pro	Val	Asp	Thr	Glu	Leu	Pro	Ala	Glu	Arg	530	535	540	
Val	Ala	Tyr	Leu	Leu	Gly	Asp	Ser	Ala	Ala	Ala	Val	Arg	Leu	Gly	Thr	545	550	555	560
Ala	Glu	Thr	Leu	Ala	Ala	Leu	Pro	Asp	Gly	Pro	Ala	Ala	Asp	Val	Asp	565	570	575	
Val	His	Ala	Pro	Glu	Ile	Ala	Arg	Glu	Ser	Pro	Ser	Pro	Leu	Arg	Leu	580	585	590	
Glu	Pro	Leu	Pro	Asp	Gln	Leu	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	595	600	605	
Thr	Gly	Leu	Ser	Lys	Gly	Val	Gly	Val	Ser	His	Gly	Gly	Leu	Ala	Asn	610	615	620	
Tyr	Val	Gly	Trp	Ala	Ser	Val	Leu	Tyr	Gly	Gly	Leu	Ser	Ala	Pro	Leu	625	630	635	640
His	Ser	Ser	Leu	Ala	Phe	Asp	Leu	Thr	Val	Thr	Ser	Val	Phe	Val	Pro	645	650	655	
Leu	Val	Cys	Gly	Gly	Ser	Val	Val	Val	Ser	Ala	Ala	Gly	Gly	Gly	Arg	660	665	670	
Gly	Leu	Ala	Ser	Leu	Leu	Ala	Ala	Gly	Asp	Gly	Phe	Ser	Leu	Val	Lys	675	680	685	
Val	Val	Pro	Gly	His	Leu	Arg	Leu	Leu	Ala	Glu	Leu	Val	Pro	Ala	Gly	690	695	700	
Glu	Met	Ala	Ala	Val	Gly	Ser	Leu	Val	Ala	Gly	Gly	Glu	Val	Leu	Ala	705	710	715	720
Gly	Gly	Asp	Val	Arg	Glu	Trp	Leu	Ser	Arg	Val	Pro	Gly	Ser	Val	Val	725	730	735	
Val	Asn	Glu	Tyr	Gly	Pro	Thr	Glu	Thr	Val	Val	Gly	Cys	Ser	Val	Phe	740	745	750	
Ser	Val	Ala	Ala	Gly	Asp	Val	Val	Gly	Asp	Val	Val	Pro	Val	Gly	Arg	755	760	765	
Pro	Val	Ala	Asn	Thr	Arg	Leu	Phe	Val	Leu	Asp	Glu	Gly	Leu	Arg	Pro	770	775	780	
Val	Pro	Ala	Gly	Val	Ala	Gly	Glu	Leu	Tyr	Val	Ala	Gly	Ser	Gln	Val	785	790	795	800
Ala	Arg	Gly	Tyr	Val	Gly	Arg	Ser	Gly	Leu	Thr	Ala	Ser	Arg	Phe	Val	805	810	815	
Ala	Cys	Pro	Phe	Gly	Val	Gly	Glu	Arg	Met	Tyr	Arg	Thr	Gly	Asp	Val	820	825	830	
Val	Arg	Leu	Ala	Gly	Gly	Asp	Leu	Val	Phe	Val	Gly	Arg	Val	Asp	Glu	835	840	845	

Gln Val Lys Ile Arg Gly Tyr Arg Val Glu Pro Asp Glu Val Arg Leu
 850 855 860
 Val Val Ala Gly His Pro Arg Val Ala Gly Ala Ala Val Val Ala Arg
 865 870 875 880
 Pro Asp Ala Val Gly Glu Arg Gln Leu Val Ala Tyr Val Val Ala Ala
 885 890 895
 Gly Glu Pro Ala Gly Leu Ala Glu Ser Val Arg Ala His Val Ala Glu
 900 905 910
 Arg Leu Pro Glu Tyr Met Val Pro Ala Ala Val Val Thr Leu Asp Glu
 915 920 925
 Ile Pro Leu Thr Val Asn Gly Lys Val Asp Arg Ala Ala Leu Pro Glu
 930 935 940
 Pro Gly Pro Val Ala Thr Gly Asn Ala Asp Arg Glu Pro Thr Thr Glu
 945 950 955 960
 Arg Glu Ser Leu Leu Cys Gly Ala Phe Ala Asp Val Leu Gly Ile Glu
 965 970 975
 Arg Val Gly Val Asp Asp Asp Phe Phe Ser Leu Gly Gly His Ser Leu
 980 985 990
 Leu Ala Thr Ser Leu Val Ser Arg Val Arg Leu Val Leu Gly Glu Glu
 995 1000 1005
 Leu Pro Ile Glu Glu Leu Phe Ala Thr Pro Thr Pro Ala Glu Leu
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 Ala Ala Trp Leu Gln Arg Asn Ala Asp Arg Pro Gln Pro Ala Arg
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 Pro Ala Leu Arg Pro Met His Glu Arg Glu Thr Thr Ala
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 <212> PRT
 <213> Actinoplanes sp.
 <400> 14
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 Val Glu Gly Pro Asp Ala Thr Tyr Asn Ser Pro Ala Val Leu Arg Leu
 20 25 30
 Thr Gly Glu Leu Asp Thr Ala Ala Leu Glu His Ala Leu Arg Asp Val
 35 40 45
 Leu Glu Arg His Glu Val Leu Arg Thr Val Tyr Pro Asp Val Gly Gly
 50 55 60
 Glu Pro Arg Gln Arg Val Val Arg Pro Asp Asp Met Val Trp Glu Leu
 65 70 75 80

Pro Thr Thr Arg Val Ser Gly Ala Gly Ala Gly Asp Asp Arg Leu Val
 85 90 95
 Thr Leu Asp Glu Leu Pro Trp Asp Arg Pro Val Leu Asp Leu Pro Ser
 100 105 110
 Pro Ala Pro Ala Gly Arg Glu Pro Asp Gly Glu Ile Thr Val Asp Glu
 115 120 125
 Leu Pro Gly Ala Ile Ala Arg Val Ala Ala His Pro Phe Asp Leu Ser
 130 135 140
 Ile Glu Ile Pro Val Arg Ala Arg Leu Phe Ala Leu Gly Pro Arg His
 145 150 155 160
 His Val Leu Val Val Val Leu His His Ile Ala Thr Asp Gly Ser Ser
 165 170 175
 Gly Gly Pro Phe Ala Arg Asp Leu Ala Ala Ala Tyr Arg Ala Arg Arg
 180 185 190
 Thr Gly Thr Ala Pro Gln Trp Ala Pro Leu Pro Val Gln Tyr Ala Asp
 195 200 205
 Tyr Ala Ala Trp Gln Gln Glu Leu Leu Gly Ala Glu Asp Asp Pro Asp
 210 215 220
 Ser Val Ile Ser Arg Gln Leu Ala His Trp Gln Glu Arg Leu Ala Gly
 225 230 235 240
 Met Pro Val Glu Leu Asp Leu Pro Ala Asp Arg Pro Arg Pro Ala Glu
 245 250 255
 Pro Gly His Gly Gly His Thr Lys Ala Leu Ser Leu Pro Pro Ala Val
 260 265 270
 His Arg Gly Leu Ala Thr Leu Ala Arg Arg Arg Arg Ala Thr Leu Gln
 275 280 285
 Met Val Val Gln Thr Gly Val Ala Ile Leu Leu Ser Lys Leu Gly Ala
 290 295 300
 Gly Arg Asp Val Pro Leu Gly Ile Pro Val Ala Gly Arg Thr Asp Ala
 305 310 315 320
 Ala Leu Asp Asp Leu Ile Gly Phe Phe Val Asn Thr Leu Val Val Arg
 325 330 335
 Ala Asp Leu Ser Gly Asp Pro Thr Val Ala Asp Ala Leu Gly Arg Val
 340 345 350
 Arg Gly Gly Ala Val Ala Ala Leu Ala Asp Gln Asp Val Pro Phe Asp
 355 360 365
 Lys Leu Val Glu Arg Leu Ala Pro Ala Arg Val Leu Gly Arg His Pro
 370 375 380
 Leu Phe Gln Val Met Val Ala Pro Leu Asp Asp Gly Thr Pro Ile Asp
 385 390 395 400

Leu Asp Gly Val Arg Gly Glu Pro Leu Thr Ile Gly Arg Ser Gly Ala
 405 410 415
 Lys Phe Asp Val Glu Val Met Thr Gly Glu Val Arg Ala Ala Asp Gly
 420 425 430
 Ala Pro Ala Gly Ile Arg Gly Ile Leu Thr Leu Ser Ala Asp Leu Phe
 435 440 445
 Asp Glu Ala Thr Ala Gly Arg Met Ala Ala Gly Leu Val Arg Val Leu
 450 455 460
 Thr Ala Met Ala Glu Ala Pro Glu Arg Arg Leu Ser Gly Ile Glu Val
 465 470 475 480
 Leu Ser Pro Gly Glu Arg Ser Arg Leu Leu Val Glu Trp Asn Asp Thr
 485 490 495
 Ala Arg Pro Val Val Glu Ser Ser Val Pro Ala Leu Phe Ala Lys Arg
 500 505 510
 Val Ala Ala Thr Pro Asp Ala Thr Ala Val Val Gly Glu Gly Val Ser
 515 520 525
 Trp Ser Tyr Arg Glu Leu Asp Arg Arg Ser Asp Val Leu Ala Arg Arg
 530 535 540
 Leu Val Ala Ala Gly Val Gly Val Glu Ser Pro Val Val Val Ala Leu
 545 550 555 560
 Glu Arg Ser Pro Glu Val Leu Ser Ala Phe Leu Ala Val Ala Lys Ala
 565 570 575
 Gly Gly Val Phe Val Pro Val Asp Leu Ser Trp Pro Gln Ala Arg Val
 580 585 590
 Asp Ala Val Val Ala Asp Cys Ala Ala Arg Val Ala Val Ala Asp Arg
 595 600 605
 Pro Met Ser Gly Leu Thr Val Val Ser Ala Gly Leu Gly Gly Asp Ser
 610 615 620
 Ala Val Val Ser Ala Asp Leu Thr Ala Asp Arg Ala Val Val Leu Pro
 625 630 635 640
 Ser Arg Pro Val Pro Gly Ala Ala Val Tyr Arg Met Tyr Thr Ser Gly
 645 650 655
 Ser Thr Gly Arg Pro Lys Gly Val Val Thr Thr His Gln Asn Leu Val
 660 665 670
 Asp Leu Ala Thr Asp Thr Cys Trp Gly Pro Thr Pro Arg Val Leu Phe
 675 680 685
 His Ala Pro His Ala Phe Asp Ala Ser Ser Tyr Glu Ile Trp Val Pro
 690 695 700
 Leu Leu Asn Gly Gly Thr Val Val Val Ala Pro Gln Arg Ser Ile Asp
 705 710 715 720

Ala Thr Val Leu Lys Asp Leu Ile Arg Ala His Asp Leu Thr His Val	725	730	735
His Val Thr Ala Gly Leu Leu Arg Val Leu Asp Pro Ser Cys Phe Ala	740	745	750
Gly Leu Thr Glu Val Leu Thr Gly Gly Asp Ala Val Ser Ala Glu Ala	755	760	765
Val Arg Arg Val Lys Asp Ala Asn Pro Gly Leu Arg Val Arg Gln Leu	770	775	780
Tyr Gly Pro Thr Glu Val Thr Leu Cys Ala Thr Gln His Leu Leu Asp	785	790	795
Asp Gly Val Pro Ile Gly Arg Pro Leu Asp Asn Thr Arg Val Tyr Val	805	810	815
Leu Asp Asp Leu Leu Gln Pro Val Pro Val Gly Val Thr Gly Glu Leu	820	825	830
Tyr Val Ala Gly Ala Gly Val Ala Arg Gly Tyr Ala Gly Met Pro Gly	835	840	845
Leu Thr Ala Glu Arg Phe Val Ala Asp Pro Phe Asn Thr Gly Gly Arg	850	855	860
Leu Tyr Arg Thr Gly Asp Leu Val Arg Trp Thr Asp Asp Gly Val Leu	865	870	875
His Phe Ala Gly Arg Ala Asp Asp Gln Val Lys Ile Arg Gly Tyr Arg	885	890	895
Val Glu Pro Gly Glu Val Glu Ala Val Leu Ala Gln His Pro Asp Val	900	905	910
Ser Gln Val Ala Val Val Val Arg Glu Asp Thr Pro Gly Asp Lys Arg	915	920	925
Leu Val Ala Tyr Val Val Gly Gly Asp Ile Glu Ala Tyr Gly Gln Glu	930	935	940
Arg Leu Pro Gly Tyr Met Val Pro Ser Ala Phe Val His Leu Asp Ala	945	950	955
Leu Pro Leu Thr Ser Asn Gln Lys Val Asp Arg Ala Ala Leu Pro Ala	965	970	975
Pro Ser Met Glu Ser Gly Ala Gly Arg Ala Pro Ala Asp Ala Arg Glu	980	985	990
Glu Leu Val Cys Ala Ala Phe Ala Glu Val Leu Gly Leu Asp Arg Val	995	1000	1005
Gly Val Asp Asp Asp Phe Phe Ala Leu Gly Gly His Ser Leu Leu	1010	1015	1020
Ala Val Ser Leu Val Glu Asp Leu Arg Gln Arg Gly Leu His Val	1025	1030	1035

Ser	Val	Arg	Ala	Leu	Phe	Ala	Thr	Pro	Thr	Pro	Ala	Ala	Leu	Ala	
1040						1045					1050				
Val	Ser	Thr	Val	Ala	Ala	Pro	Ile	Glu	Val	Pro	Pro	Asn	Leu	Ile	
1055						1060					1065				
Pro	Gln	Gly	Gly	Ala	Arg	Glu	Leu	Thr	Pro	Asp	Met	Leu	Pro	Leu	
1070						1075					1080				
Val	Asp	Leu	Thr	Gly	Glu	Glu	Leu	Ala	Thr	Ile	Val	Ala	Ala	Val	
1085						1090					1095				
Pro	Gly	Gly	Ala	Ala	Asn	Ile	Ala	Asp	Ile	Tyr	Pro	Leu	Ala	Pro	
1100						1105					1110				
Leu	Gln	Glu	Gly	Ile	Phe	Phe	His	His	Leu	Met	Thr	Glu	Gly	Asp	
1115						1120					1125				
Thr	Ala	Asp	Val	Tyr	Ala	Leu	Pro	Tyr	Leu	Leu	Arg	Val	Gly	Thr	
1130						1135					1140				
Arg	Glu	Gln	Leu	Asp	Ala	Phe	Leu	Gly	Ala	Leu	Gln	Gln	Val	Val	
1145						1150					1155				
Asp	Arg	His	Asp	Val	Tyr	Arg	Thr	Ala	Ile	Ala	Trp	Gln	Asn	Leu	
1160						1165					1170				
Arg	Glu	Pro	Val	Gln	Val	Val	His	Arg	His	Ala	Thr	Leu	Pro	Val	
1175						1180					1185				
Thr	Glu	Val	Thr	Pro	Asp	Gln	Leu	His	Ala	Ala	Ala	Thr	Gly	Gly	
1190						1195					1200				
Arg	Leu	Pro	Leu	Asp	His	Ala	Pro	Leu	Leu	Ser	Val	His	Ile	Ala	
1205						1210					1215				
Pro	Glu	Pro	Asp	Gly	Gly	Trp	Leu	Ala	Leu	Leu	Arg	Met	His	His	
1220						1225					1230				
Leu	Val	Gln	Asp	His	Thr	Ala	Leu	Asp	Ile	Val	Leu	Asp	Glu	Ile	
1235						1240					1245				
Arg	Thr	Ile	Leu	Ala	Gly	Ala	Thr	Asp	His	Leu	Pro	Pro	Pro	Val	
1250						1255					1260				
Pro	Phe	Arg	Asn	Phe	Val	Ala	Arg	Ser	Arg	Arg	Gly	Ala	Ala	Glu	
1265						1270					1275				
Ala	Ala	His	Arg	Asp	Tyr	Phe	Thr	Gly	Leu	Leu	Gly	Asp	Val	Thr	
1280						1285					1290				
Glu	Thr	Thr	Ala	Pro	Tyr	Gly	Leu	Thr	Asp	Val	His	Gly	Glu	His	
1295						1300					1305				
Ser	Gly	Val	Arg	Arg	Gly	Arg	Leu	Ala	Val	Ser	Ala	Gly	Leu	Ala	
1310						1315					1320				
Gly	Arg	Val	Arg	Glu	Thr	Ala	Arg	Asp	Arg	Gly	Val	Ser	Pro	Ala	
1325						1330					1335				

Thr	Leu	Phe	His	Leu	Ala	Trp	Ala	Arg	Val	Leu	Ala	Ala	Val	Ser
1340						1345					1350			
Gly	Arg	Asp	Asp	Val	Val	Phe	Gly	Thr	Val	Leu	Leu	Gly	Arg	Met
1355						1360					1365			
Asp	Ala	Gly	Pro	Gly	Ala	Asp	Arg	Val	Pro	Gly	Leu	Phe	Met	Asn
1370						1375					1380			
Thr	Leu	Pro	Val	Arg	Val	Arg	Leu	Gly	Gly	Arg	Thr	Val	Asp	Glu
1385						1390					1395			
Ala	Leu	His	Gly	Met	Arg	Ala	Gln	Leu	Ala	Asp	Leu	Leu	Thr	His
1400						1405					1410			
Glu	His	Ala	Pro	Leu	Val	Leu	Ala	Gln	Gln	Ser	Ala	Gly	Leu	Pro
1415						1420					1425			
Gly	Gly	Ser	Pro	Leu	Phe	Thr	Ser	Leu	Phe	Asn	Tyr	Arg	His	Asn
1430						1435					1440			
Ala	Thr	Asp	Ile	Glu	Arg	Ser	Gly	Thr	Gly	Ile	Asp	Gly	Val	Glu
1445						1450					1455			
Ala	Leu	Pro	Thr	Gly	Asp	Pro	Ser	Asn	Tyr	Pro	Leu	Asp	Val	Ser
1460						1465					1470			
Val	Asn	Gln	Ser	Pro	Leu	Gly	Phe	Glu	Leu	Val	Val	Glu	Ala	Thr
1475						1480					1485			
Glu	Pro	Ala	Asp	Pro	Asp	Gln	Leu	Cys	Arg	Leu	Leu	His	Ala	Cys
1490						1495					1500			
Leu	Asp	Asp	Leu	Ile	Ala	Ala	Leu	Asp	Glu	Gln	Pro	Gly	Arg	Ala
1505						1510					1515			
Leu	Gly	Thr	Leu	Asp	Val	Val	Ala	Gly	Arg	Glu	Arg	Asp	Leu	Leu
1520						1525					1530			
Leu	Asp	Gly	Trp	Asn	Ala	Thr	Ala	Val	Pro	Ala	Gln	Pro	Ala	Leu
1535						1540					1545			
Val	Pro	Glu	Leu	Phe	Thr	Ala	Gln	Ala	Ala	Arg	Thr	Pro	Thr	Trp
1550						1555					1560			
Pro	Ala	Leu	Val	Thr	Ala	Gly	Ala	Glu	Met	Ser	Tyr	Ala	Glu	Leu
1565						1570					1575			
Glu	Glu	Arg	Ser	Asn	Arg	Leu	Ala	Arg	Trp	Leu	Ala	Gly	Arg	Gly
1580						1585					1590			
Val	Gly	Ala	Asp	Asp	Arg	Val	Ala	Leu	Met	Met	Arg	Arg	Gly	Pro
1595						1600					1605			
Glu	Leu	Met	Val	Ala	Ile	Leu	Ala	Val	Leu	Lys	Ala	Gly	Ala	Ala
1610						1615					1620			
Tyr	Leu	Pro	Val	Asp	Pro	Asp	Leu	Pro	Arg	Asp	Arg	Val	Asp	Tyr
1625						1630					1635			

Leu	Leu	Ala	Asp	Ala	Ala	Pro	Ala	Phe	Val	Leu	Ala	Glu	Arg	Ala
1640						1645					1650			
Thr	Ala	Pro	Trp	Val	Pro	Val	Ala	Gly	Gly	Ile	Pro	Val	Leu	Val
1655						1660					1665			
Val	Asp	Ala	Pro	Ala	Val	Ala	Ala	Glu	Val	Ala	Ala	His	Ser	Gly
1670						1675					1680			
Glu	Ala	Val	Thr	Asp	Arg	Asp	Arg	Arg	Ala	Ala	Leu	Arg	Gly	Gly
1685						1690					1695			
His	Leu	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg	Pro
1700						1705					1710			
Lys	Gly	Val	Leu	Ile	Thr	His	Asp	Gly	Leu	Ala	Asn	Leu	Thr	Leu
1715						1720					1725			
Asp	His	Gly	Arg	Phe	Gly	Leu	Gly	Pro	Gly	Ala	Arg	Val	Ala	Gln
1730						1735					1740			
Phe	Ala	Ser	Pro	Gly	Phe	Asp	Met	Phe	Val	Asp	Glu	Trp	Ser	Met
1745						1750					1755			
Ala	Leu	Leu	Ala	Gly	Ala	Ala	Leu	Thr	Phe	Val	Pro	Pro	Glu	Arg
1760						1765					1770			
Arg	Leu	Gly	Ala	Asp	Leu	Ala	Ala	Phe	Leu	Ala	Glu	Tyr	Gly	Val
1775						1780					1785			
Thr	His	Ala	Thr	Leu	Pro	Pro	Ala	Val	Val	Gly	Thr	Ile	Pro	Asp
1790						1795					1800			
Gly	Val	Leu	Pro	Pro	Ser	Phe	Val	Leu	Asp	Val	Gly	Gly	Asp	Val
1805						1810					1815			
Leu	Pro	Gly	Asp	Leu	Ala	Arg	Arg	Trp	Leu	Arg	Asp	Gly	Arg	Val
1820						1825					1830			
Leu	Phe	Asn	Ser	Tyr	Gly	Pro	Thr	Glu	Thr	Thr	Val	Asn	Ala	Ala
1835						1840					1845			
Thr	Trp	Arg	Ala	Glu	Ala	Gly	Asp	Trp	Gly	Ser	Val	Ala	Pro	Ile
1850						1855					1860			
Gly	Thr	Pro	Val	Pro	Asn	Leu	Arg	Ala	Tyr	Val	Leu	Asp	Gly	Trp
1865						1870					1875			
Leu	Arg	Pro	Val	Pro	Val	Gly	Ala	Asp	Gly	Glu	Leu	Tyr	Val	Ser
1880						1885					1890			
Gly	Ala	Gly	Leu	Ala	Arg	Gly	Tyr	Leu	Asn	Arg	Ala	Gly	Leu	Thr
1895						1900					1905			
Ala	Glu	Arg	Phe	Val	Ala	Cys	Pro	Phe	Glu	Pro	Gly	Glu	Arg	Met
1910						1915					1920			
Tyr	Arg	Thr	Gly	Asp	Val	Val	Arg	Trp	Thr	Ala	Glu	Gly	Arg	Leu
1925						1930					1935			

Val	Phe	Ala	Gly	Arg	Ser	Asp	Asp	Gln	Val	Lys	Ile	Arg	Gly	Phe
1940						1945					1950			
Arg	Ile	Glu	Pro	Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Ala	Gly	Pro
1955						1960					1965			
Gly	Val	Ser	Gln	Ala	Ala	Val	Ile	Val	Arg	Glu	Asp	Val	Pro	Gly
1970						1975					1980			
Asp	Lys	Arg	Leu	Val	Ala	Tyr	Val	Val	Gly	Gly	Asp	Val	Glu	Ala
1985						1990					1995			
Leu	Arg	Ser	Tyr	Ala	Gln	Gln	Arg	Leu	Pro	Gly	Tyr	Met	Val	Pro
2000						2005					2010			
Ser	Ala	Phe	Val	Glu	Leu	Asp	Arg	Leu	Pro	Leu	Thr	Val	Asn	Gly
2015						2020					2025			
Lys	Leu	Asp	Arg	Arg	Ala	Leu	Pro	Val	Pro	Asp	Leu	Ala	Arg	Gly
2030						2035					2040			
Thr	Gly	Ser	Gly	Arg	Pro	Ala	Gly	Thr	Pro	Arg	Glu	Gln	Leu	Leu
2045						2050					2055			
Cys	Ala	Gly	Phe	Ala	Ala	Val	Leu	Gly	Val	Asp	Asp	Val	Gly	Ala
2060						2065					2070			
Asp	Asp	Asp	Phe	Phe	Ala	Leu	Gly	Gly	His	Ser	Leu	Leu	Val	Val
2075						2080					2085			
Ser	Leu	Val	Glu	Trp	Leu	Arg	Arg	Arg	Gly	Val	Ser	Val	Pro	Val
2090						2095					2100			
Arg	Ala	Leu	Phe	Thr	Thr	Pro	Thr	Pro	Ala	Gly	Leu	Ala	Glu	Ala
2105						2110					2115			
Val	Gly	Asp	Gly	Ala	Val	Val	Val	Pro	Pro	Asn	Leu	Ile	Pro	Glu
2120						2125					2130			
Gly	Ala	Ala	Glu	Leu	Thr	Pro	Glu	Met	Val	Pro	Leu	Ala	Asp	Leu
2135						2140					2145			
Thr	Ser	Glu	Glu	Leu	Ala	Ile	Val	Val	Ala	Ser	Val	Pro	Gly	Gly
2150						2155					2160			
Ala	Ala	Asn	Val	Ala	Asp	Val	Tyr	Pro	Leu	Ala	Pro	Leu	Gln	Glu
2165						2170					2175			
Gly	Ile	Phe	Phe	Pro	Val	Ala	Thr	Gly	Pro	Gln	Cys	Tyr	Ala	Thr
2180						2185					2190			
Val	Gly	Ser	Ser	Leu	Pro	Asp	Asp	Gly	Gly	Ser	Ala	Pro	Cys	Ser
2195						2200					2205			
Arg	Phe	Arg	Arg	Arg	Cys	Val	Ser	Thr	Ser	Val	Val	Trp	Gln	Gly
2210						2215					2220			
Leu	Arg	Glu	Pro	Val	Gln	Val	Val	Trp	Arg	His	Ala	Arg	Leu	Pro
2225						2230					2235			

Val	Glu	Glu	Val	Val	Leu	His	Glu	Gly	Ala	Asp	Pro	Val	Glu	Gln
2240						2245					2250			
Met	Met	Ala	Leu	Ala	Gly	Gly	Trp	Met	Asp	Leu	Thr	Arg	Ala	Pro
2255						2260					2265			
Leu	Ile	Asp	Val	His	Ile	Ala	Ala	Gly	Pro	Gly	Gly	Asp	Arg	Trp
2270						2275					2280			
Leu	Ala	Val	Leu	Arg	Ile	His	His	Leu	Val	Gln	Asp	His	Thr	Ala
2285						2290					2295			
Leu	Glu	Thr	Leu	Leu	Asp	Glu	Leu	Gln	Ser	Phe	Leu	Glu	Gly	Arg
2300						2305					2310			
Gly	Gly	Glu	Leu	Ala	Glu	Pro	Val	Pro	Phe	Arg	Glu	Phe	Val	Ala
2315						2320					2325			
Gln	Ala	Arg	Leu	Gly	Val	Pro	Arg	Glu	Glu	His	Glu	Arg	Tyr	Phe
2330						2335					2340			
Ala	Glu	Leu	Leu	Gly	Asp	Ile	Thr	Glu	Thr	Thr	Ala	Pro	Tyr	Asp
2345						2350					2355			
Leu	Thr	Asp	Val	His	Gly	Asp	Gly	Thr	Gly	Tyr	Asp	His	Gly	Ala
2360						2365					2370			
Leu	Pro	Leu	Asp	Ala	Thr	Val	Ala	Ala	Arg	Val	Arg	Glu	Ala	Ala
2375						2380					2385			
Arg	Thr	Leu	Gly	Val	Ser	Pro	Ala	Thr	Leu	Phe	His	Leu	Ala	Trp
2390						2395					2400			
Ala	Arg	Val	Leu	Gly	Thr	Leu	Ala	Gly	Arg	Asp	Asp	Val	Val	Phe
2405						2410					2415			
Gly	Thr	Val	Leu	Phe	Gly	Arg	Met	Asn	Ser	Gly	Ala	Gly	Ala	Asp
2420						2425					2430			
Arg	Val	Ser	Gly	Leu	Phe	Ile	Asn	Thr	Leu	Pro	Val	Arg	Val	Arg
2435						2440					2445			
Leu	Gly	Ala	Pro	Thr	Gly	Asp	Ala	Leu	Gly	Asp	Leu	Arg	Asp	Gln
2450						2455					2460			
Leu	Ala	Glu	Leu	Leu	Val	His	Glu	His	Ala	Ser	Leu	Ala	Ser	Ala
2465						2470					2475			
Gln	Lys	Ala	Ser	Gly	Leu	Pro	Gly	Gly	Ser	Pro	Leu	Phe	Thr	Ser
2480						2485					2490			
Ile	Phe	Asn	Tyr	Arg	His	Asn	Gln	Val	Ser	Ala	Glu	Arg	Glu	Thr
2495						2500					2505			
Ala	Ala	Leu	Pro	Gly	Ile	Arg	Val	Leu	Ala	Ala	Arg	Asp	Ser	Thr
2510						2515					2520			
Asn	Tyr	Pro	Leu	Thr	Val	Ala	Val	Asp	Asp	Asp	Gly	His	Gly	Phe
2525						2530					2535			

Thr	Leu	Val	Val	Glu	Val	Ala	Ser	Thr	Val	Asp	Ala	Ala	Gly	Val
2540						2545					2550			
Cys	Glu	Leu	Leu	His	Thr	Ala	Val	Asp	Asn	Leu	Ile	Ala	Ala	Leu
2555						2560					2565			
Thr	Asp	Arg	Pro	Gly	Gly	Pro	Leu	Ala	Glu	Val	Asp	Ile	Leu	Glu
2570						2575					2580			
Arg	Gly	Leu	Arg	Asp	Arg	Leu	Leu	Thr	Ala	Trp	Asn	Glu	Ala	Arg
2585						2590					2595			
Glu	Pro	Ala	Pro	Pro	Val	Thr	Leu	Pro	Asp	Leu	Phe	Asp	Arg	Gln
2600						2605					2610			
Ala	Arg	Arg	Thr	Pro	Glu	Ala	Val	Ala	Leu	Thr	Ala	Asp	Gly	Val
2615						2620					2625			
Ser	Leu	Thr	Tyr	Arg	Glu	Leu	Ser	Glu	Arg	Ala	Asn	Arg	Ile	Ala
2630						2635					2640			
Arg	Leu	Leu	Thr	Ser	Arg	Gly	Ile	Gly	Pro	Glu	Ser	Leu	Val	Gly
2645						2650					2655			
Val	Val	Leu	Pro	Arg	Ser	Ala	Asp	Leu	Val	Val	Ala	Leu	Leu	Gly
2660						2665					2670			
Val	Leu	Gln	Ala	Gly	Ala	Ala	Tyr	Val	Pro	Val	Asp	Ala	Asp	Tyr
2675						2680					2685			
Pro	Ala	Glu	Arg	Ile	Gly	Tyr	Ile	Leu	Gly	Asp	Ala	Gly	Ala	Val
2690						2695					2700			
Cys	Val	Leu	Thr	Val	Asp	Ala	Thr	Ala	Gly	Ala	Val	Pro	Pro	Gly
2705						2710					2715			
Val	Pro	Lys	Leu	Val	Leu	Asp	His	Pro	Glu	Thr	Val	Thr	Ala	Leu
2720						2725					2730			
Ala	Ala	Cys	Asp	Thr	Ala	Pro	Leu	Gly	Glu	Ala	Glu	Arg	Ala	Gly
2735						2740					2745			
Glu	Leu	Leu	Pro	Glu	His	Pro	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly
2750						2755					2760			
Ser	Thr	Gly	Thr	Pro	Lys	Gly	Val	Leu	Ile	Pro	His	Arg	Asn	Val
2765						2770					2775			
Val	Glu	Leu	Phe	Ala	Ala	Thr	Arg	Gly	Ser	Phe	His	Phe	Gly	Glu
2780						2785					2790			
Gly	Asp	Val	Trp	Ser	Trp	Phe	His	Ser	Val	Ala	Phe	Asp	Phe	Ser
2795						2800					2805			
Val	Trp	Glu	Leu	Trp	Gly	Ala	Leu	Leu	His	Gly	Gly	Arg	Val	Val
2810						2815					2820			
Met	Val	Pro	Phe	Ala	Val	Ser	Arg	Ser	Pro	Arg	Asp	Phe	Trp	Glu
2825						2830					2835			

Leu	Leu	Val	Arg	Glu	Arg	Val	Thr	Val	Leu	Ser	Gln	Thr	Pro	Ser
2840						2845					2850			
Ala	Phe	Tyr	Gln	Leu	Ala	Ala	Ala	Ala	Asp	Asp	Thr	Pro	Asp	Ala
2855						2860					2865			
Leu	Arg	Val	Val	Val	Phe	Gly	Gly	Glu	Ala	Leu	Asp	Pro	Gly	Arg
2870						2875					2880			
Leu	Ala	Gly	Trp	Arg	Glu	Arg	Arg	Pro	Asp	Gly	Pro	Arg	Leu	Val
2885						2890					2895			
Asn	Met	Tyr	Gly	Ile	Thr	Glu	Thr	Thr	Val	His	Val	Thr	His	Gln
2900						2905					2910			
Asp	Leu	Ala	Pro	Ala	Asp	Thr	Thr	Gly	Ser	Pro	Ile	Gly	Arg	Gly
2915						2920					2925			
Ile	Pro	Gly	Leu	Ser	Val	Tyr	Val	Leu	Asp	Glu	Ala	Leu	Arg	Pro
2930						2935					2940			
Val	Pro	Pro	Gly	Val	Ala	Gly	Glu	Val	Tyr	Val	Ala	Gly	Arg	Gln
2945						2950					2955			
Leu	Ala	Arg	Ala	Tyr	Leu	Gly	Arg	Ala	Ala	Leu	Thr	Gly	Thr	Arg
2960						2965					2970			
Phe	Val	Ala	Cys	Pro	Phe	Leu	Pro	Ala	Gly	Glu	Arg	Met	Tyr	Arg
2975						2980					2985			
Thr	Gly	Asp	Arg	Ala	Arg	Trp	Ser	Arg	Gly	Arg	Leu	Gln	Phe	Ala
2990						2995					3000			
Gly	Arg	Thr	Asp	Asp	Gln	Val	Gln	Ile	Arg	Gly	Phe	Arg	Ile	Glu
3005						3010					3015			
Pro	Gly	Glu	Val	Gln	Ala	Val	Val	Ala	Ala	His	Pro	Glu	Ile	Ala
3020						3025					3030			
Ala	Ala	Ala	Val	Val	Val	Arg	Glu	Asp	Val	Pro	Gly	Asp	Pro	Arg
3035						3040					3045			
Leu	Thr	Ala	Tyr	Val	Val	Pro	Ala	Gly	Pro	Arg	Thr	Ala	Pro	Ala
3050						3055					3060			
Ala	Val	Ala	Glu	Thr	Val	Arg	Arg	Phe	Ala	Ala	Asp	Arg	Leu	Pro
3065						3070					3075			
Ala	Tyr	Met	Leu	Pro	Ser	Ala	Val	Val	Val	Leu	Asp	Ala	Leu	Pro
3080						3085					3090			
Leu	Thr	Asp	His	Gly	Lys	Leu	Asp	Arg	Arg	Ala	Leu	Pro	Ala	Pro
3095						3100					3105			
Gln	His	Thr	Gly	Ala	Ala	Ser	Gly	Arg	Ala	Pro	Ala	Thr	Val	Ala
3110						3115					3120			
Glu	Glu	Val	Leu	Cys	Ala	Ala	Phe	Ala	Glu	Val	Leu	Gly	Val	Glu
3125						3130					3135			

Arg Val	Gly Val	Asp Asp	Asp	Phe Phe	Ala Leu	Gly	Gly His	Ser	
3140			3145			3150			
Leu Leu	Ile Val	Ser Leu	Val	Glu Arg	Val Arg	Arg	Ala Gly	Leu	
3155			3160			3165			
Ala Ile	Pro Val	Arg Ala	Leu	Phe Arg	Ser Ala	Thr	Pro Ala	Gly	
3170			3175			3180			
Leu Ala	Ala Leu	Ala Arg	Pro	Tyr Arg	Val Asp	Ile	Pro Pro	Asn	
3185			3190			3195			
Leu Val	Pro Asp	Gly Ala	Arg	Glu Ile	Thr Pro	Asp	Met Leu	Thr	
3200			3205			3210			
Leu Ala	Ala Leu	Thr Glu	Ala	Glu Ile	Ala Thr	Val	Leu Ala	Thr	
3215			3220			3225			
Val Pro	Gly Gly	Ala Val	Asn	Val Ala	Asp Ile	Tyr	Pro Leu	Ala	
3230			3235			3240			
Pro Leu	Gln Glu	Gly Ile	Phe	Phe His	His Leu	Met	Ala Asp	Ala	
3245			3250			3255			
Gly Arg	Ala Asp	Ala Tyr	Ala	Met Pro	Tyr Val	Leu	His Leu	Asp	
3260			3265			3270			
Thr Ala	Glu Arg	Leu Asp	Val	Leu Leu	Gly Ala	Leu	Gln Arg	Val	
3275			3280			3285			
Ile Asp	Arg Asn	Asp Ile	Tyr	Arg Thr	Gly Val	Val	Ser Ala	Gly	
3290			3295			3300			
Leu Arg	Glu Pro	Val Gln	Val	Val Trp	Arg Ser	Ala	Val Leu	Pro	
3305			3310			3315			
Val Glu	Glu Val	Ala Leu	Asp	Gly Gly	His Asp	Pro	Val Glu	Gln	
3320			3325			3330			
Leu Leu	Ala Ala	Ala Gly	Glu	Glu Phe	Asp Leu	Thr	Arg Ala	Pro	
3335			3340			3345			
Leu Ile	Arg Ala	His Val	Ala	Ala His	Pro Asp	Gly	Gly Arg	Leu	
3350			3355			3360			
Leu Leu	Leu Arg	Ile His	His	Leu Val	Gln Asp	His	Thr Thr	Phe	
3365			3370			3375			
Asp Val	Val Leu	Gly Glu	Leu	Arg Ala	Phe Leu	Glu	Gly Arg	Gly	
3380			3385			3390			
Gly Glu	Leu Ala	Glu Pro	Val	Pro Phe	Arg Glu	Phe	Val Ala	Gln	
3395			3400			3405			
Ala Arg	Leu Gly	Val Pro	Arg	Glu Glu	His Glu	Arg	Tyr Phe	Ala	
3410			3415			3420			
Glu Leu	Leu Gly	Asp Val	Thr	Glu Thr	Thr Ala	Pro	Tyr Gly	Leu	
3425			3430			3435			

Thr	Asp	Val	His	Gly	Asp	Gly	Ser	Arg	Ala	Val	Gln	Val	Ser	Leu
3440						3445					3450			
Pro	Val	Ala	Glu	Ala	Leu	Ala	Val	Arg	Val	Arg	Glu	Val	Ala	Arg
3455						3460					3465			
Thr	Leu	Gly	Val	Ser	Pro	Ala	Thr	Val	Phe	His	Leu	Ala	Trp	Ala
3470						3475					3480			
Arg	Val	Leu	Ser	Val	Ile	Ala	Gly	Arg	Asp	Asp	Val	Val	Phe	Gly
3485						3490					3495			
Thr	Ile	Leu	Phe	Gly	Arg	Met	Asn	Ser	Gly	Ala	Ala	Ala	Glu	Arg
3500						3505					3510			
Val	Pro	Gly	Leu	Phe	Ile	Asn	Thr	Leu	Pro	Val	Arg	Val	Arg	Leu
3515						3520					3525			
Asn	Gly	Thr	Ser	Val	Gly	Glu	Ala	Leu	Thr	Ala	Leu	Arg	Asp	Gln
3530						3535					3540			
Met	Ala	Glu	Leu	Met	Ala	His	Glu	His	Ala	Pro	Leu	Ala	Leu	Ala
3545						3550					3555			
Gln	Arg	Ala	Gly	Gly	Val	Pro	Ala	Gly	Ser	Pro	Leu	Phe	Thr	Ser
3560						3565					3570			
Leu	Phe	Asn	Tyr	Arg	His	Asn	Val	Ala	Gly	Gly	Gly	Asp	Gly	Gly
3575						3580					3585			
Ala	Leu	Glu	Gly	Val	Thr	Pro	Val	Leu	His	Arg	Asp	Thr	Thr	Asn
3590						3595					3600			
Tyr	Pro	Val	Val	Val	Ser	Val	Asp	Asp	Asp	Gly	Thr	Ser	Phe	Asp
3605						3610					3615			
Leu	Val	Val	Glu	Ala	Val	Ala	Pro	Ala	Glu	Ala	Gly	Arg	Val	Gly
3620						3625					3630			
Arg	Leu	Met	His	Glu	Cys	Leu	Ala	Glu	Leu	Val	Gly	Ala	Leu	Ala
3635						3640					3645			
Gly	Ala	Pro	Glu	Thr	Pro	Leu	Ser	Arg	Val	Arg	Val	Ile	Asp	Glu
3650						3655					3660			
Ala	Glu	Ile	Glu	Arg	Val	Val	His	Ser	Trp	Asn	Asp	Thr	Ala	Arg
3665						3670					3675			
Pro	Val	Val	Glu	Ser	Ser	Val	Pro	Ala	Leu	Phe	Ala	Glu	Gln	Val
3680						3685					3690			
Ala	Ala	Ala	Pro	Asp	Ala	Thr	Ala	Val	Val	Gly	Glu	Gly	Val	Ser
3695						3700					3705			
Trp	Ser	Tyr	Arg	Glu	Leu	Asp	Ala	Arg	Ser	Asp	Ala	Leu	Ala	Arg
3710						3715					3720			
Ser	Leu	Val	Ala	Ala	Gly	Val	Gly	Val	Glu	Ser	Pro	Val	Val	Val
3725						3730					3735			

Asp	Leu	Val	Arg	Trp	Thr	Asp	Asp	Gly	Val	Leu	His	Phe	Ala	Gly
4040						4045					4050			
Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg	Gly	Tyr	Arg	Val	Glu	Pro
4055						4060					4065			
Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Gln	His	Pro	Asp	Val	Ser	Gln
4070						4075					4080			
Val	Ala	Val	Val	Val	Arg	Glu	Asp	Thr	Pro	Gly	Asp	Lys	Arg	Leu
4085						4090					4095			
Val	Ala	Tyr	Val	Val	Gly	Gly	Asp	Val	Glu	Ala	Tyr	Ala	Gln	Glu
4100						4105					4110			
Arg	Leu	Pro	Gly	Tyr	Leu	Val	Pro	Ser	Ala	Phe	Val	His	Leu	Asp
4115						4120					4125			
Ala	Leu	Pro	Leu	Thr	Ser	Asn	Gln	Lys	Val	Asp	Arg	Ala	Ala	Leu
4130						4135					4140			
Pro	Ala	Pro	Ser	Val	Glu	Ser	Gly	Val	Gly	Arg	Ala	Pro	Ala	Asp
4145						4150					4155			
Ala	Arg	Glu	Glu	Leu	Met	Cys	Ala	Ala	Phe	Ala	Glu	Val	Leu	Asp
4160						4165					4170			
Leu	Asp	Arg	Val	Gly	Val	Asp	Asp	Asp	Phe	Phe	Ala	Leu	Gly	Gly
4175						4180					4185			
His	Ser	Leu	Leu	Val	Val	Arg	Leu	Val	Gly	Arg	Ile	Arg	Gln	Val
4190						4195					4200			
Phe	Gly	Val	Glu	Val	Ser	Ala	Arg	Leu	Val	Phe	Asp	Ala	Arg	Thr
4205						4210					4215			
Pro	Ala	Gly	Val	Val	Ala	Arg	Leu	Ser	Glu	Gly	Gly	Thr	Ala	Arg
4220						4225					4230			
Glu	Ala	Val	Arg	Ala	Arg	Val	Arg	Pro	Ala	Arg	Val	Pro	Leu	Ser
4235						4240					4245			
Phe	Ala	Gln	Arg	Arg	Leu	Trp	Phe	Leu	Ser	Gln	Leu	Glu	Gly	Pro
4250						4255					4260			
Ser	Ala	Thr	Tyr	Asn	Ile	Pro	Val	Ala	Leu	Arg	Leu	Asp	Gly	Pro
4265						4270					4275			
Leu	Asp	Arg	Asp	Ala	Leu	Thr	Ala	Ala	Leu	His	Asp	Val	Val	Ala
4280						4285					4290			
Arg	His	Glu	Val	Leu	Arg	Thr	Val	Phe	Thr	Val	Ala	Asp	Gly	Glu
4295						4300					4305			
Pro	Trp	Gln	Gln	Ile	Leu	Asp	Asp	Pro	Gln	Val	Ser	Val	Pro	Val
4310						4315					4320			
Val	Glu	Val	Thr	Pro	Asp	Arg	Leu	Pro	Glu	Ala	Val	Ala	Val	Ala
4325						4330					4335			

His	Ala	Thr	Leu	Leu	Gly	Ala	Ala	Asp	Leu	Phe	Glu	Gln	Glu	Thr
4640						4645					4650			
Val	Arg	Ala	Leu	Ala	Asp	Arg	Leu	Leu	Arg	Thr	Leu	Glu	Ala	Met
4655						4660					4665			
Ala	Ala	Ala	Pro	Asp	Asp	Arg	Leu	Asp	Arg	Ile	Glu	Val	Leu	Ser
4670						4675					4680			
Pro	Gly	Glu	Arg	Ser	Arg	Leu	Leu	Val	Glu	Trp	Asn	Asp	Thr	Ala
4685						4690					4695			
Arg	Pro	Val	Val	Glu	Ser	Ser	Val	Pro	Ala	Leu	Phe	Ala	Glu	Gln
4700						4705					4710			
Val	Ala	Ala	Ala	Pro	Asp	Ala	Val	Ala	Val	Val	Gly	Glu	Gly	Val
4715						4720					4725			
Ser	Trp	Thr	Tyr	Arg	Glu	Leu	Asp	Ala	Arg	Ser	Asp	Ala	Leu	Ala
4730						4735					4740			
Arg	Ser	Leu	Val	Ala	Ala	Gly	Val	Gly	Val	Glu	Ser	Pro	Val	Val
4745						4750					4755			
Val	Ala	Leu	Glu	Arg	Ser	Pro	Glu	Val	Leu	Ser	Ala	Phe	Leu	Ala
4760						4765					4770			
Val	Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp
4775						4780					4785			
Pro	Gln	Ala	Arg	Val	Asp	Ala	Val	Val	Ala	Asp	Cys	Gly	Ala	Arg
4790						4795					4800			
Ile	Ala	Val	Ala	Asp	Arg	Pro	Met	Ser	Gly	Leu	Thr	Val	Val	Ser
4805						4810					4815			
Ala	Gly	Leu	Gly	Gly	Asp	Ser	Ala	Val	Val	Ser	Gly	Asp	Leu	Thr
4820						4825					4830			
Ala	Asp	Arg	Ala	Val	Val	Leu	Pro	Ala	Gly	Pro	Val	Pro	Gly	Ala
4835						4840					4845			
Ala	Val	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg	Pro	Lys
4850						4855					4860			
Gly	Val	Val	Thr	Thr	His	Gln	Asn	Leu	Val	Asp	Leu	Ala	Thr	Asp
4865						4870					4875			
Thr	Cys	Trp	Gly	Pro	Thr	Pro	Arg	Val	Leu	Phe	His	Ala	Pro	His
4880						4885					4890			
Ala	Phe	Asp	Ala	Ser	Ser	Tyr	Glu	Ile	Trp	Val	Pro	Leu	Leu	Asn
4895						4900					4905			
Gly	Gly	Thr	Val	Val	Val	Ala	Pro	Arg	Arg	Ser	Ile	Asp	Ala	Thr
4910						4915					4920			
Val	Leu	Arg	Asp	Leu	Ile	Gly	Ala	His	Glu	Leu	Thr	His	Val	His
4925						4930					4935			

Val Thr Ala Gly Leu Leu Arg	Val Leu Asp Pro Ser Cys Phe Ala
4940	4945 4950
Gly Leu Thr Glu Val Leu Thr	Gly Gly Asp Ala Val Ser Ala Glu
4955	4960 4965
Ala Val Arg Arg Val Lys Asp	Ala Asn Pro Gly Leu Arg Val Arg
4970	4975 4980
Gln Leu Tyr Gly Pro Thr Glu	Val Thr Leu Cys Ala Thr Gln His
4985	4990 4995
Leu Leu Asp Asp Gly Val Pro	Ile Gly Arg Pro Leu Asp Asn Thr
5000	5005 5010
Arg Val Tyr Val Leu Asp Asp	Leu Leu Arg Pro Val Pro Thr Gly
5015	5020 5025
Val Val Gly Glu Leu Tyr Val	Ala Gly Ser Gly Leu Ala Arg Gly
5030	5035 5040
Tyr Ala Gly Met Pro Gly Leu	Thr Ala Glu Arg Phe Val Ala Asp
5045	5050 5055
Pro Phe Asn Thr Gly Gly Arg	Leu Tyr Arg Thr Gly Asp Leu Val
5060	5065 5070
Arg Trp Ala Asp Asp Gly Val	Leu His Phe Ala Gly Arg Ala Asp
5075	5080 5085
Asp Gln Val Lys Ile Arg Gly	Tyr Arg Val Glu Pro Gly Glu Val
5090	5095 5100
Glu Ala Val Leu Ala Gln His	Pro Asp Val Ser Gln Val Ala Val
5105	5110 5115
Val Val Arg Glu Asp Thr Pro	Gly Asp Lys Arg Leu Val Ala Tyr
5120	5125 5130
Val Val Gly Gly Asp Val Glu	Ala Tyr Ala Gln Glu Arg Leu Pro
5135	5140 5145
Gly Tyr Met Val Pro Ser Ala	Phe Val Gln Leu Asp Ala Leu Pro
5150	5155 5160
Leu Thr Ser Asn Gln Lys Val	Asp Arg Ala Ala Leu Pro Ala Pro
5165	5170 5175
Ser Met Glu Ser Gly Ala Gly	Arg Ala Pro Ala Asp Ala Arg Glu
5180	5185 5190
Glu Leu Met Cys Ala Ala Phe	Ala Glu Val Leu Asp Leu Asp Arg
5195	5200 5205
Val Gly Val Asp Asp Asp Phe	Phe Ala Leu Gly Gly His Ser Leu
5210	5215 5220
Leu Ala Val Ser Leu Val Glu	Asn Leu Arg Arg His Gly Val His
5225	5230 5235

Ile Ser Val Arg Ala Leu Phe	Ala Thr Pro Thr Pro	Ala Ala Leu
5240	5245	5250
Ala Ala Ser Ala Gly Thr Ala	Val Pro Asp Val Pro	Pro Asn Leu
5255	5260	5265
Ile Pro Gln Gly Gly Ala Gln	Glu Leu Thr Pro Asp	Met Leu Pro
5270	5275	5280
Leu Val Asp Leu Thr Gly Glu	Glu Leu Ala Thr Ile	Val Ala Ala
5285	5290	5295
Val Pro Gly Gly Ala Pro Asn	Ile Ala Asp Ile Tyr	Pro Leu Ala
5300	5305	5310
Pro Leu Gln Glu Gly Ile Phe	Phe His His Leu Met	Thr Glu Gly
5315	5320	5325
Asp Ala Thr Asp Val Tyr Leu	Leu Pro Arg Ile Leu	Gly Phe Gly
5330	5335	5340
Gly Arg Pro Glu Leu Asp Ala	Phe Leu Gly Ala Leu	Gln Gln Val
5345	5350	5355
Val Asp Arg His Asp Val Tyr	Arg Thr Ala Ile Ala	Trp Gln Asn
5360	5365	5370
Leu Arg Glu Pro Val Gln Val	Val His Arg His Ala	Thr Leu Pro
5375	5380	5385
Val Thr Glu Val Thr Pro Asp	Gln Leu His Ala Ala	Ala Thr Gly
5390	5395	5400
Gly Arg Leu Pro Leu Asp His	Ala Pro Leu Leu Ser	Val His Ile
5405	5410	5415
Ala Pro Glu Pro Asp Gly Gly	Trp Leu Ala Leu Leu	Arg Met His
5420	5425	5430
His Leu Val Gln Asp His Thr	Ala Leu Asp Ile Val	Leu Asp Glu
5435	5440	5445
Ile Arg Thr Ile Leu Ala Gly	Ala Thr Asp His Leu	Pro Pro Pro
5450	5455	5460
Val Pro Phe Arg Asp Phe Val	Ala Gln Ala Arg Leu	Gly Val Ser
5465	5470	5475
Arg Ala Glu Gln Glu Arg Tyr	Phe Ala Gly Leu Leu	Gly Asp Val
5480	5485	5490
Thr Glu Thr Thr Ala Pro Tyr	Gly Leu Ala Asp Val	Thr Asn Asp
5495	5500	5505
Gly Thr Ala Ser Val Arg Ala	Glu Val Glu Leu Asp	Ala Ala Leu
5510	5515	5520
Ala Ala Arg Leu Arg Asp Leu	Ala Arg Asp Arg Gly	Val Ser Pro
5525	5530	5535

Ala Thr Val Phe His Leu	Ala Trp Ala Arg Val Leu	Ala Ala Val
5540	5545	5550
Ala Asp Arg Glu Asp Val	Val Phe Gly Thr Val Leu	Phe Gly Arg
5555	5560	5565
Met Ala Ser Gly Ala Arg	Arg Val Pro Gly Leu Phe	Met Asn Thr
5570	5575	5580
Leu Pro Val Arg Val Arg	Leu Ser Gly Thr Ala Ala	Glu Ala Leu
5585	5590	5595
Gly Gln Val Arg Asp Arg	Leu Ala Glu Leu Met Ala	His Glu His
5600	5605	5610
Ala Pro Leu Ala Leu Ala	Gln Gln Ala Ser Gly Leu	Pro Ala Gly
5615	5620	5625
Ser Pro Leu Phe Thr Ser	Leu Phe Asn Tyr Arg Tyr	Ala Arg Pro
5630	5635	5640
Pro Ala Ala Thr Pro Asp	Asp Pro Leu Ala Gly Val	Arg Thr Leu
5645	5650	5655
Phe Ala Trp Glu Arg Asn	Asn Tyr Pro Val Thr Val	Ser Ile Asp
5660	5665	5670
Asp Asp Gly Thr Gly Phe	Ala Val Thr Val Asp Val	Val Ala Pro
5675	5680	5685
Ala Asp Ala Asp Glu Val	Val Arg Leu Leu Arg Thr	Thr Leu Thr
5690	5695	5700
Arg Leu Ala Ala Ala Leu	Glu Arg Thr Pro Glu Met	Pro Val Ala
5705	5710	5715
Asp Val Arg Pro Gly Arg	Val Ser Arg Pro Ala Ala	Gly Arg Ala
5720	5725	5730
Val Leu Val Pro Val Pro	Ala Gly Glu Arg Ala Thr	Gly Ala Gly
5735	5740	5745
Arg Ala Pro Ala Thr Ala	Tyr Glu Glu Leu Ile Cys	Gln Ala Tyr
5750	5755	5760
Ala Gln Val Leu Glu Val	Asp Arg Val Ala Ala Asp	Asp Asp Phe
5765	5770	5775
Phe Ala Leu Gly Gly Asn	Ser Leu Leu Ala Thr Arg	Leu Val Ser
5780	5785	5790
Arg Ile Arg Ser Ala Leu	Gly Val Glu Val Thr Ile	Arg Ala Leu
5795	5800	5805
Phe Glu Thr Leu Thr Pro	Gln Arg Leu Ala Ala Arg	Leu Thr Arg
5810	5815	5820
Ala Ser Ala Pro Gly Arg	Val Ala Pro Ala Pro Arg	Thr Arg Pro
5825	5830	5835

Glu	Arg	Ile	Pro	Leu	Ser	Phe	Ala	Gln	Arg	Arg	Leu	Trp	Phe	Leu
5840						5845					5850			
Gly	Glu	Leu	Glu	Gly	Ser	Ser	Ala	Thr	Tyr	Ser	Asn	Thr	Thr	Ala
5855						5860					5865			
Leu	Arg	Leu	Ser	Gly	Glu	Leu	Asp	Pro	Ala	Ala	Leu	Thr	Ala	Ala
5870						5875					5880			
Leu	His	Asp	Val	Ile	Gly	Arg	His	Glu	Val	Leu	Arg	Thr	Val	Ile
5885						5890					5895			
Pro	Ala	Glu	Asp	Gly	Arg	Pro	Tyr	Gln	Leu	Val	Leu	Pro	Pro	Glu
5900						5905					5910			
Glu	Ala	Arg	Pro	Ala	Val	Glu	Ile	Val	Glu	Val	Ala	Pro	Gly	Glu
5915						5920					5925			
Leu	Gly	Ala	Ala	Val	Asp	Glu	Val	Ala	Gly	Tyr	Ala	Phe	Asp	Leu
5930						5935					5940			
Ala	Ala	Glu	Ile	Pro	Val	Arg	Ala	Arg	Leu	Ile	Arg	Leu	Gly	Ala
5945						5950					5955			
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<400> 15

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Thr Gly Thr Val Asp Ala Ala Ala Leu Glu Thr Ala Leu Arg Asp Val
35 40 45

Leu Glu Arg His Glu Val Leu Arg Thr Val Tyr Pro Asp Ala Gly Gly
50 55 60

Glu Pro His Gln Arg Ile Leu Pro Leu Gly Glu Thr Gly Phe Gly Leu
65 70 75 80

Arg Val Ala Glu Val Thr Asp Gly Glu Leu Asp Ala Ala Val Ala Asp
85 90 95

Ala Thr Gly His Ala Phe Asp Leu Ala Thr Glu Ile Pro Val Arg Ala

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Ser	Leu	Leu	Thr	Val	Glu	Pro	Gly	Arg	His	Val	Leu	Ala	Leu	Val	Leu
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Leu	Ser	Thr	Ala	Tyr	Thr	Ala	Arg	Leu	Ala	Gly	Gly	Glu	Pro	Ala	Trp
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Ser	Pro	Leu	Pro	Val	Gln	Tyr	Ala	Asp	Tyr	Ala	Leu	Trp	Gln	Gln	Glu
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Val	Leu	Gly	Ala	Gly	Asp	Asp	Pro	Glu	Ser	Leu	Leu	Arg	Glu	Gln	Val
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Thr	Val	Val	Ala	Gly	Arg	Thr	Asp	Ala	Gly	Leu	Asp	Asp	Leu	Val	Gly
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Cys	Phe	Val	Asn	Asn	Leu	Val	Ile	Arg	Ala	Asp	Leu	Thr	Gly	Asp	Pro
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Leu	Leu	Ser	Pro	Ala	Asp	Arg	Arg	Leu	Ile	Leu	Arg	Gly	Trp	Asn	Asp
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Thr	Ala	Ala	Pro	Ala	Pro	Ala	Gly	Leu	Val	Pro	Asp	Leu	Phe	Ala	Ala
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Gln	Ala	Ala	Arg	Thr	Pro	Asp	Ala	Val	Ala	Val	Ala	Gly	Pro	Asp	Arg
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Ile	Ala	Asp	Ile	Val	Ala	Asp	Ala	Ala	Pro	Ala	Leu	Val	Leu	Ala	Gln
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Ala	Ser	Thr	Ala	Asp	Val	Val	Ala	Asp	Ala	Ser	Pro	Ala	Leu	Val	Leu
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Ala	Pro	Ala	Ser	Asp	Gly	Val	Pro	Thr	Gly	Ala	Val	Pro	Val	His	Leu
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Val	Ala	Val	Ile	Val	Arg	Glu	Asp	Val	Pro	Gly	Asp	Lys	Arg	Leu	Val	
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Leu Pro Gly Val Ser Gln Ala	Ala Val Ile Val Arg	Glu Asp Val

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Pro Gly Asp Lys Arg Leu Val 1970	Ala Tyr Leu Val 1975	Ala Ala Pro Glu 1980
Thr Val Glu Ala Ala Arg 1985	Ala His Ala Glu Gln 1990	Arg Leu Pro Ser 1995
Tyr Leu Val Pro Ser Ala 2000	Phe Val Gln Leu Asp 2005	Ala Leu Pro Leu 2010
Thr Gly Asn Gln Lys Val 2015	Asp Arg Ala Ala Leu 2020	Pro Ala Pro Leu 2025
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Val Gly Pro Asp Asp Asp 2060	Phe Phe Ala Leu Gly 2065	Gly His Ser Leu 2070
Leu Ala Leu Ala Leu Val 2075	Glu Arg Leu Arg Arg 2080	Gln Gly Leu Gly 2085
Val Ser Val Arg Ala Val 2090	Phe Asp Ala Arg Thr 2095	Pro Ala Ala Leu 2100
Thr Arg Arg Gly Asp Gly 2105	Gly Ala Asp Asp Arg 2110	Pro Ala Leu Arg 2115
Ala Gly Ala Arg Pro Ala 2120	Arg Leu Pro Leu Ser 2125	Tyr Ala Gln Arg 2130
Arg Leu Trp Phe Leu Ala 2135	Gln Leu Glu Gly Pro 2140	Ser Ala Thr Tyr 2145
Asn Ile Pro Val Ala Leu 2150	Arg Leu Glu Gly Asp 2155	Leu Asp Arg Asp 2160
Ala Leu Thr Ala Ala Leu 2165	Arg Asp Val Val Ala 2170	Arg His Glu Val 2175
Leu Arg Thr Val Phe Thr 2180	Val Ala Asp Gly Glu 2185	Pro Trp Gln His 2190
Ile Leu Asp Pro Ala Arg 2195	Ala Glu Pro Ala Leu 2200	Pro Val Val Asp 2205
Val Pro Ala Gly Arg Val 2210	Glu Glu Ala Val Ala 2215	Glu Ala Ala Ala 2220
Tyr Ala Phe Asp Leu Ala 2225	Arg Glu Ile Pro Leu 2230	Arg Ala Val Leu 2235
Leu Ala Pro Gly Asp Gly 2240	Thr His Val Leu Val 2245	Leu Val Leu His 2250
His Ile Ala Ala Asp Gly 2255	Trp Ser Met Arg Pro 2260	Leu Ala Arg Asp 2265

2255	2260	2265
Leu Ala Thr Ala Tyr Ala Ala	Arg Arg Arg Gly Gln Ala Pro Glu	
2270	2275	2280
Ser Glu Thr Leu Pro Val Gln	Tyr Ala Asp Tyr Ala Leu Trp Gln	
2285	2290	2295
Arg Asp Leu Leu Gly Ser Asp	Ser Asp Pro Ala Ser Leu Ile Ser	
2300	2305	2310
Arg Gln Ile Ala His Trp Arg	Glu Arg Leu Asp Gly Val Pro Glu	
2315	2320	2325
Glu Leu Asp Leu Pro Ala Asp	Arg Pro Arg Pro Ala Ala Ala Ser	
2330	2335	2340
His Arg Gly His Leu His Ser	Ala Glu Ile Pro Ala Asp Val His	
2345	2350	2355
Arg Ser Leu Arg Arg Val Ala	Ala Asp His Gly Ala Thr Val Phe	
2360	2365	2370
Met Thr Leu Gln Ala Ala Val	Ala Val Leu Leu Ser Arg Leu Gly	
2375	2380	2385
Ala Gly Thr Asp Val Pro Ile	Gly Thr Val Val Ala Gly Arg Ala	
2390	2395	2400
Asp Arg Ala Leu Glu Asn Leu	Val Gly Phe Phe Val Asn Thr Leu	
2405	2410	2415
Val Leu Arg Thr Asp Leu Thr	Gly Asp Pro Arg Leu Thr Asp Val	
2420	2425	2430
Leu Gly Gln Val Arg Glu Leu	Thr Leu Arg Ala Leu Ala His Gln	
2435	2440	2445
Asp Val Pro Phe Glu Lys Leu	Val Glu Glu Leu Thr Pro Ala Arg	
2450	2455	2460
Ser Leu Ala Arg His Pro Leu	Phe Gln Val Met Val Thr Leu Asp	
2465	2470	2475
Gly Gly Gly Pro Asp Gly Ala	Glu Leu Pro Gly Leu Ala Met Ser	
2480	2485	2490
Val Val Pro Thr Gly Ala Val	Pro Ala Lys Phe Asp Leu Asp Leu	
2495	2500	2505
Thr Phe Thr Glu Thr Phe Asp	Ala Ala Gly Glu Pro Ala Gly Leu	
2510	2515	2520
Arg Val Asp Leu Ile Ala Ala	Ala Asp Leu Phe Asp Ala Gly Thr	
2525	2530	2535
Ala Ala Arg Leu Ala Gly Tyr	Leu Ser Arg Val Leu Gly Val Leu	
2540	2545	2550
Ala Ala Asp Pro Arg Arg Arg	Leu Ala Glu Val Asp Pro Leu Glu	

2555		2560		2565
Ala Glu Glu Ser Arg Leu Met	Leu Ala Ala Gly	Glu Glu Pro Ala		
2570	2575	2580		
Pro Ala Leu Pro Glu Ile Thr	Val Ala Ala Leu	Val Ala Glu Gln		
2585	2590	2595		
Cys Ala Arg Thr Pro Gly Ala	Val Ala Val Thr	Gly Pro Asp Ala		
2600	2605	2610		
Ser Leu Thr Tyr Ala Glu Leu	Asp Glu Arg Ala	Ala Arg Ile Ala		
2615	2620	2625		
Arg Trp Leu Arg Arg His Gly	Ala Gly Pro Gly	Ala Ala Val Cys		
2630	2635	2640		
Val Leu Met Glu Arg Ser Ala	Glu Leu Val Ala	Val Leu Leu Gly		
2645	2650	2655		
Val Met Arg Ala Gly Ala Ala	Tyr Val Pro Val	Asp Pro Ala Tyr		
2660	2665	2670		
Pro Ala Glu Arg Ile Arg Phe	Val Val Thr Asp	Ala Arg Ala Ala		
2675	2680	2685		
Cys Val Val Ser Glu Ser Ala	Ser Ala Gly Leu	Val Pro Asp Gly		
2690	2695	2700		
Val Pro Cys Leu Ala Ile Asp	Asp Pro Ala Ala	Ala Ala Glu Pro		
2705	2710	2715		
Ala Glu Pro Gly Asp Asp Pro	Gly Asp Ala Ala	Gly Pro Arg Pro		
2720	2725	2730		
Asp Asp Pro Ala Tyr Ile Ile	Tyr Thr Ser Gly	Ser Thr Gly Thr		
2735	2740	2745		
Pro Lys Gly Val Val Val Ser	His Arg Asn Val	Val Ala Leu Leu		
2750	2755	2760		
Thr Ala Thr Arg Pro Leu Phe	Gly Phe Ala Gly	Asp Glu Val Trp		
2765	2770	2775		
Ser Trp Phe His Ser Val Ala	Phe Asp Phe Ser	Val Trp Glu Leu		
2780	2785	2790		
Trp Gly Ala Leu Thr His Gly	Gly Arg Val Val	Val Val Pro Tyr		
2795	2800	2805		
Ala Val Ser Arg Ser Pro Arg	Asp Phe Trp Glu	Leu Val Val Arg		
2810	2815	2820		
Glu Gly Val Thr Val Leu Ser	Gln Thr Pro Ser	Ala Phe Ala Gln		
2825	2830	2835		
Leu Met Ala Ala Ala Gly Asp	Asp Asp Arg Asp	Ala Leu Arg Phe		
2840	2845	2850		
Val Val Phe Gly Gly Glu Ala	Leu Asp Pro Gly	Arg Leu Ala Gly		

2855	2860	2865
Trp Leu Ala Arg Arg Pro Asp Lys Pro Arg Leu Val Asn Met Tyr		
2870	2875	2880
Gly Ile Thr Glu Thr Thr Val His Thr Thr Tyr Gln His Ile Ala		
2885	2890	2895
Pro Gly Thr Thr Gly Ser Val Ile Gly Arg Gly Leu Pro Gly Phe		
2900	2905	2910
Gly Leu Tyr Val Leu Asp Glu Ala Leu Arg Pro Val Pro Ala Gly		
2915	2920	2925
Val Pro Gly Glu Val Tyr Ala Arg Gly Pro Gln Val Ala Arg Gly		
2930	2935	2940
Tyr Ile Gly Arg Pro Gly Leu Thr Ala Glu Arg Phe Val Ala Ser		
2945	2950	2955
Pro Phe Ala Pro Gly Glu Arg Met Tyr Arg Thr Gly Asp Val Ala		
2960	2965	2970
Arg Trp Thr Ala Asp Gly Arg Leu Val Phe Ala Gly Arg Ser Asp		
2975	2980	2985
Asp Gln Ile Lys Ile Arg Gly Phe Arg Ile Glu Pro Gly Glu Val		
2990	2995	3000
Glu Ala Val Leu Ala Ala Gly Pro Gly Val Ser Gln Ala Ala Val		
3005	3010	3015
Ile Val Arg Glu Asp Val Pro Gly Asp Lys Arg Leu Val Ala Tyr		
3020	3025	3030
Val Val Gly Gly Asp Ala Glu Thr Leu Arg Ser His Ala Gln Gln		
3035	3040	3045
Arg Leu Pro Gly Tyr Leu Val Pro Ser Ala Phe Val Glu Leu Asp		
3050	3055	3060
Arg Leu Pro Leu Thr Val Asn Gly Lys Leu Asp Arg Arg Ala Leu		
3065	3070	3075
Pro Val Pro Asp Tyr Gly Arg Asp Ala Gly Gly Gly Arg Ala Pro		
3080	3085	3090
Ala Asn Ala Arg Glu Glu Val Leu Cys Arg Ala Phe Ala Glu Val		
3095	3100	3105
Leu Gly Val Glu Arg Val Gly Val Glu Asp Asp Phe Phe Ala Leu		
3110	3115	3120
Gly Gly His Ser Leu Leu Val Val Ser Leu Val Glu Arg Leu Arg		
3125	3130	3135
Arg Gln Gly Ile Ser Val Pro Val Arg Ala Leu Phe Thr Thr Pro		
3140	3145	3150
Thr Pro Ala Gly Leu Ala Glu Ala Val Gly Asp Gly Ala Val Val		

3155	3160	3165
Val Pro Pro Asn Leu Ile	Pro Glu Asp Ala Ala	Glu Leu Thr Pro
3170	3175	3180
Glu Met Leu Pro Leu Ala	Asp Leu Thr Ala Asp	Glu Leu Ala Val
3185	3190	3195
Val Val Ala Ser Val Pro	Gly Gly Ala Ala Asn	Ile Ala Asp Val
3200	3205	3210
Tyr Pro Leu Ala Pro Leu	Gln Glu Gly Ile Phe	Phe His His Met
3215	3220	3225
Met Ala Asp Arg Asp Ser	Ala Asp Val Tyr Val	Thr Pro Thr Val
3230	3235	3240
Val Glu Phe Asp Ser Arg	Asp Arg Leu Asp Gly	Phe Leu Ala Ala
3245	3250	3255
Leu Gln Gln Val Val Asp	Arg Thr Asp Val Tyr	Arg Thr Ser Val
3260	3265	3270
Val Trp Gln Gly Leu Arg	Glu Pro Val Gln Val	Val Trp Arg His
3275	3280	3285
Ala Arg Leu Pro Ile Asp	Glu Val Glu Leu His	Glu Gly Thr Asp
3290	3295	3300
Pro Ala Glu Gln Leu Ile	Ala Leu Ala Thr Glu	Arg Val Asp Leu
3305	3310	3315
Asp Arg Ala Pro Leu Ile	Arg Thr Thr Thr Ala	Ala Val Pro Gly
3320	3325	3330
Ser Gly Arg Trp Leu Ala	Leu Leu Arg Ile His	His Leu Val Gln
3335	3340	3345
Asp His Thr Thr Leu Asp	Val Leu Leu Gly Glu	Leu Arg Ala Phe
3350	3355	3360
Leu Glu Gly Arg Gly Asp	Glu Leu Pro Glu Pro	Val Pro Phe Arg
3365	3370	3375
Glu Phe Val Ala Gln Ala	Arg Leu Gly Val Pro	Arg Glu Glu His
3380	3385	3390
Glu Arg Tyr Phe Ala Glu	Leu Leu Gly Asp Val	Thr Glu Thr Thr
3395	3400	3405
Ala Pro Tyr Gly Leu Thr	Glu Val His Gly Asp	Gly Ser Ala Ala
3410	3415	3420
Val His Ser Arg Arg Glu	Val Asp Asp Asp Leu	Ala Ala Arg Leu
3425	3430	3435
His Arg Leu Ala Arg Ser	Leu Gly Val Ser Pro	Ala Ala Leu Phe
3440	3445	3450
His Leu Ala Trp Ala Arg	Val Leu Gly Ala Val	Ser Gly Arg Asp

3455	3460	3465
Asp Val Val Phe Gly Thr	Val Leu Phe Gly Arg	Met Asn Ser Gly
3470	3475	3480
Ala Ala Ala Asp Arg Val	Gln Gly Leu Phe Ile	Asn Thr Leu Pro
3485	3490	3495
Val Arg Val Arg Leu Ala	Ala Gly Ser Thr Arg	Asp Ala Leu Thr
3500	3505	3510
Gly Leu Arg Asp Gln Leu	Ala Gly Leu Leu Val	His Glu His Ala
3515	3520	3525
Pro Leu Ala Leu Ala Gln	Arg Ala Ala Gly Ile	Thr Asp Gly Ser
3530	3535	3540
Pro Leu Phe Ala Ser Ile	Phe Asn Tyr Arg His	Asn Gln Asp Asp
3545	3550	3555
Pro Ala Ala Ser Ala Gly	Leu Glu Gly Ile Arg	Thr Val Tyr Ser
3560	3565	3570
Ala Glu His Thr Asn Tyr	Pro Leu Asp Ala Ser	Ile Asp Val Thr
3575	3580	3585
Gly Asp Arg Phe Ala Ile	Thr Val Asn Ala Val	Ala Pro Ala Asp
3590	3595	3600
Ala Ala Arg Ile Ala Glu	Leu Met His Thr Cys	Leu Gly His Leu
3605	3610	3615
Ala Asp Val Leu Glu Asp	Ala Pro Glu Thr Pro	Leu Ser Trp Val
3620	3625	3630
Ser Pro Leu Ser Ala Glu	Asp Leu Gly Arg Ile	Val Gly Asp Trp
3635	3640	3645
Asn Glu Thr Arg Arg Ala	Val Thr Arg Ala Ser	Val Pro Glu Leu
3650	3655	3660
Phe Ala Lys Gln Val Ala	Ala Thr Pro Asp Ala	Ile Ala Val Ala
3665	3670	3675
Gly Glu Gly Val Ser Trp	Ser Tyr Arg Glu Leu	Asp Val Arg Ser
3680	3685	3690
Asp Ala Leu Ala Arg Ser	Leu Val Ala Ala Gly	Val Gly Ile Glu
3695	3700	3705
Ser Pro Val Val Val Ala	Leu Asp Arg Ser Pro	Glu Val Pro Thr
3710	3715	3720
Ala Phe Leu Ala Val Ala	Lys Ala Gly Gly Val	Phe Val Pro Val
3725	3730	3735
Asp Leu Ser Trp Pro Gln	Ala Arg Val Asp Ala	Val Ile Ala Asp
3740	3745	3750
Cys Ala Ala Arg Val Ala	Val Ala Asp Arg Pro	Met Thr Gly Leu

3755		3760		3765
Thr Val Val Pro Ala Asp	Ala Ala Gly Asp Pro	Ala Ala Glu Leu		
3770	3775	3780		
Pro Pro Arg Pro Leu Pro	Gly Ala Glu Val Tyr	Arg Met Tyr Thr		
3785	3790	3795		
Ser Gly Ser Thr Gly Arg	Pro Lys Gly Val Val	Thr Thr His Gln		
3800	3805	3810		
Asn Leu Val Asp Leu Ala	Thr Asp Thr Cys Trp	Gly Pro Thr Pro		
3815	3820	3825		
Arg Val Leu Phe His Ala	Pro His Ala Phe Asp	Ala Ser Ser Tyr		
3830	3835	3840		
Glu Ile Trp Val Pro Leu	Leu Asn Gly Gly Thr	Val Val Val Ala		
3845	3850	3855		
Pro Gly Arg Ser Ile Asp	Ala Ala Val Leu Gly	Glu Leu Ile Arg		
3860	3865	3870		
Ala His Glu Leu Thr His	Val His Val Thr Ala	Gly Leu Leu Arg		
3875	3880	3885		
Val Leu Asp Pro Ser Cys	Phe Ala Gly Leu Thr	Glu Val Leu Thr		
3890	3895	3900		
Gly Gly Asp Ala Val Ser	Ala Glu Ala Val Arg	Arg Val Met Glu		
3905	3910	3915		
Ala Asn Pro Gly Leu Arg	Val Arg Gln Leu Tyr	Gly Pro Thr Glu		
3920	3925	3930		
Val Thr Leu Cys Ala Thr	Gln Gln Val Leu Asp	Gly Thr Gly Val		
3935	3940	3945		
Pro Ile Gly Arg Pro Leu	Asp Asn Thr Arg Val	Tyr Val Leu Asp		
3950	3955	3960		
Asp Leu Leu Gln Pro Val	Pro Val Gly Val Thr	Gly Glu Leu Tyr		
3965	3970	3975		
Val Ala Gly Ala Gly Leu	Ala Arg Gly Tyr Ala	Gly Met Pro Gly		
3980	3985	3990		
Leu Thr Ala Glu Arg Phe	Val Ala Asp Pro Phe	Ser Ser Gly Gly		
3995	4000	4005		
Arg Leu Tyr Arg Thr Gly	Asp Leu Val Arg Trp	Thr Asp Asp Gly		
4010	4015	4020		
Val Leu Val Phe Ala Gly	Arg Ala Asp Asp Gln	Val Lys Ile Arg		
4025	4030	4035		
Gly Tyr Arg Val Glu Pro	Gly Glu Val Glu Ala	Val Leu Ala Ala		
4040	4045	4050		
His Pro Asp Val Ala Gln	Val Ala Val Val Val	Arg Glu Asp Thr		

4055	4060	4065
Pro Gly Asp Lys Arg Leu Val 4070	Ala Tyr Val Val 4075	Gly Gly Asp Val 4080
Glu Ala Tyr Ala Gln Glu Arg 4085	Leu Pro Gly Tyr 4090	Leu Val Pro Ser 4095
Ala Phe Val His Leu Asp 4100	Ala Leu Pro Leu Thr 4105	Ser Asn Gln Lys 4110
Val Asp Arg Ala Ala Leu Pro 4115	Ala Pro Ser Val 4120	Glu Ser Gly Ala 4125
Gly Arg Ala Pro Ala Asp 4130	Ala Arg Glu Glu Leu 4135	Met Cys Ala Ala 4140
Phe Ala Glu Val Leu Asp 4145	Leu Asp Arg Val Gly 4150	Val Asp Asp Asp 4155
Phe Phe Ala Leu Gly Gly His 4160	Ser Leu Leu Val 4165	Val Arg Leu Val 4170
Gly Arg Ile Arg Gln Val 4175	Phe Gly Val Glu Val 4180	Ser Ala Arg Leu 4185
Val Phe Asp Ala Arg Thr 4190	Pro Ala Gly Val Val 4195	Ala Arg Leu Ser 4200
Glu Gly Gly Thr Ala Arg 4205	Glu Ala Val Arg Ala 4210	Arg Val Arg Pro 4215
Ala Arg Val Pro Leu Ser 4220	Phe Ala Gln Arg Arg 4225	Leu Trp Phe Leu 4230
Ser Gln Leu Asp Gly Thr 4235	Ser Thr Thr Tyr Asn 4240	Ile Pro Val Ala 4245
Leu Gln Leu Asp Gly Pro 4250	Leu Asp Arg Asp Ala 4255	Phe Thr Ala Ala 4260
Leu His Asp Val Val Ala 4265	Arg His Glu Val Leu 4270	Arg Thr Val Phe 4275
Thr Val Ala Asp Gly Glu 4280	Pro Trp Gln His Ile 4285	Leu Asp Thr Pro 4290
Ser Val Ser Val Pro Val 4295	Ile Glu Val Pro Ala 4300	Asp Gly Leu Pro 4305
Glu Ala Val Ala Ala Ala 4310	Ala Ala His Thr Phe 4315	Asp Leu Ser Arg 4320
Glu Ile Pro Leu Arg Ala 4325	Val Leu Leu Ala Thr 4330	Gly Ala Asp Arg 4335
His Val Leu Val Leu Val 4340	Val His His Ile Ala 4345	Ala Asp Gly Trp 4350
Ser Met Gln Pro Leu Ala 4355	Arg Asp Leu Ala Val 4360	Ala Tyr Ala Ala 4365

4355	4360	4365
Arg Ile Arg Gly Glu Ala Pro	Ala Trp Thr Ala Leu	Pro Val Gln
4370	4375	4380
Tyr Ala Asp Tyr Ala Leu Trp	Gln Arg Asp Val Leu	Gly Ser Glu
4385	4390	4395
His Asp Pro Asp Ser Ala Ile	Ser Gln Gln Val Ala	His Trp Arg
4400	4405	4410
Arg Gln Leu Ala Gly Ala Pro	Asp Glu Leu Pro Leu	Pro Ala Asp
4415	4420	4425
His Pro Arg Pro Ala Glu Ala	Thr Tyr Arg Gly His	Thr Val Glu
4430	4435	4440
Phe Thr Val Pro Pro Ala Val	His His Gln Leu Ala	Glu Leu Ala
4445	4450	4455
Arg Arg Asn Gly Val Thr Val	Phe Met Thr Val Gln	Thr Ala Leu
4460	4465	4470
Ala Val Leu Leu Ser Lys Leu	Gly Ala Gly Thr Asp	Ile Pro Ile
4475	4480	4485
Gly Val Ala Val Ala Gly Arg	Thr Asp Pro Thr Leu	Asp Asn Leu
4490	4495	4500
Ile Gly Phe Phe Val Asn Thr	Leu Val Leu Arg Thr	Asp Leu Thr
4505	4510	4515
Gly Asn Pro Thr Ile Thr Asp	Leu Leu His Arg Thr	Arg Asp Thr
4520	4525	4530
Thr Leu His Ala Phe Thr His	Gln Asp Val Pro Phe	Glu Lys Leu
4535	4540	4545
Val Glu Asp Leu Ala Pro Thr	Arg Ser Leu Ala Arg	His Pro Leu
4550	4555	4560
Phe Gln Val Met Met Thr Leu	Gln Ser Thr Gly Arg	Ala Gly Glu
4565	4570	4575
Ala Ala Glu Leu Pro Gly Leu	Glu Thr Ala Val Leu	Ser Pro Gly
4580	4585	4590
Gly Val Ala Ala Lys Val Asp	Leu Asp Leu Ser Leu	Ser Glu Ala
4595	4600	4605
Tyr Asp Asp Asp Gly Arg Pro	Ala Gly Leu Ala Gly	Thr Leu Val
4610	4615	4620
Ala Ala Ala Asp Leu Phe Glu	His Gly Thr Ala Glu	Arg Ile Ala
4625	4630	4635
Gly Tyr Leu Ala Arg Leu Leu	Ala Val Leu Pro Ala	Asp Pro Gly
4640	4645	4650
Ala Arg Leu Gly Asp Val Asp	Leu Leu Asp Gly Glu	Glu Arg Arg

4655	4660	4665
Leu Val 4670	Leu Thr Gly Trp Asn 4675	Asp Thr Thr Ala Ala Val Pro Ala 4680
Val Ala 4685	Val Pro Glu Leu Ile 4690	Glu Arg Arg Ala Ala Ala Glu Pro 4695
Glu Ala 4700	Gly Ala Val Trp Cys 4705	Gly Asp Thr His Leu Arg Tyr Gly 4710
Glu Leu 4715	Asn Ala Arg Ala Asn 4720	Arg Leu Ala Arg Leu Leu Val Glu 4725
Arg Gly 4730	Ala Gly Pro Glu Ser 4735	Ile Val Ala Val Cys Leu Glu Arg 4740
Ser Ala 4745	Asp Leu Val Val Thr 4750	Leu Leu Ala Val Leu Lys Thr Gly 4755
Ala Ala 4760	Tyr Leu Pro Ile Asp 4765	Pro Gly Tyr Pro Ala Gly Arg Ile 4770
Ala Tyr 4775	Met Leu Ala Asp Ala 4780	Arg Pro Ala Leu Leu Val Thr Ser 4785
Pro Ala 4790	Val Ala Ser Gly Asp 4795	Ser Leu Pro Asp Gly Gly Ala Gln 4800
Arg Ile 4805	Val Leu Gly Asp Pro 4810	Asp Thr Ala Ala Ala Leu Asp Gly 4815
Leu Ala 4820	Gly Thr Asp Leu Leu 4825	Val Ser Glu Arg Arg Gly Val Thr 4830
His Pro 4835	Ala His Pro Ala Tyr 4840	Val Ile Tyr Thr Ser Gly Ser Thr 4845
Gly Arg 4850	Pro Lys Gly Val Val 4855	Val Pro His Gly Ala Leu Thr Asn 4860
Phe Val 4865	Ala Ala Met Ser Asp 4870	Arg Leu Ala Leu Gly Ala Gly Asp 4875
Arg Leu 4880	Leu Ala Val Thr Thr 4885	Val Ala Phe Asp Ile His Val Leu 4890
Glu Leu 4895	Tyr Val Pro Leu Val 4900	Gly Gly Ala Gly Val Val Val Ala 4905
Glu Asp 4910	Ala Val Val Arg Asp 4915	Pro Ala Ala Val Ala Ala Leu Leu 4920
Asp Arg 4925	His Ala Val Thr Ile 4930	Val Gln Ala Thr Pro Ala Leu Trp 4935
Gln Ala 4940	Leu Leu Ala Gly His 4945	Ala Asp Ala Val Arg Asp Val Arg 4950
Leu Leu	Val Gly Gly Glu Ala	Leu Pro Pro Ala Leu Ala Gly Arg

4955	4960	4965
Met Ala Ala Ala Gly Arg Gly Val Thr Asn Leu Tyr Gly Pro Thr 4970 4975 4980		
Glu Val Thr Val Trp Ala Thr Val Ala Asp Leu Gly Ala Ser Pro 4985 4990 4995		
Ala Gly Pro Val Pro Ile Gly Thr Pro Leu Arg Asn Thr Arg Ala 5000 5005 5010		
Phe Val Leu Asp Asp Ala Leu Arg Pro Val Pro Pro Gly Val Pro 5015 5020 5025		
Gly Glu Leu Tyr Leu Ala Gly Asp Gln Leu Ala Arg Gly Tyr His 5030 5035 5040		
Gly Arg Ala Gly Leu Thr Ala Glu Arg Phe Val Ala Asp Pro Phe 5045 5050 5055		
Gly Arg Gly Glu Arg Met Tyr Arg Thr Gly Asp Arg Val Arg Trp 5060 5065 5070		
Thr Arg Gly Gly Ser Leu Glu Phe Leu Gly Arg Val Asp Asp Gln 5075 5080 5085		
Val Lys Ile Arg Gly Phe Arg Ile Glu Leu Gly Glu Val Glu Ala 5090 5095 5100		
Ala Leu Ala Ala Phe Gly Pro Val Ala Arg Ala Ala Ala Ala Val 5105 5110 5115		
Arg Glu Asp Val Pro Gly Asp Arg Arg Leu Val Gly Tyr Val Val 5120 5125 5130		
Pro Ala Ala Gly Glu Pro Glu Pro Asp Pro Ala Ala Val Arg Ala 5135 5140 5145		
His Val Ala Ala Gln Leu Pro Ala Tyr Met Val Pro Ser Ala Val 5150 5155 5160		
Val Val Leu Pro Asp Leu Pro Leu Thr Ala Asn Gly Lys Leu Asp 5165 5170 5175		
Arg Lys Ala Leu Pro Ala Pro Asp Tyr Gly Ala Ala Ser Ala Gly 5180 5185 5190		
Arg Ala Pro Ala Asp Glu Arg Glu Ala Leu Ile Cys Ala Val Phe 5195 5200 5205		
Ala Glu Thr Leu Gly Val Thr Asp Val Ala Ala Asp Ala Asp Phe 5210 5215 5220		
Phe Ala Leu Gly Gly His Ser Leu Leu Ala Val Ser Leu Val Glu 5225 5230 5235		
Arg Leu Arg Glu His Gly Ile Ala Val Pro Val Arg Ala Leu Phe 5240 5245 5250		
Gln Ser Gly Thr Pro Glu Gly Leu Ala Ala Ala Ala Arg Ala Glu		

5255	5260	5265
Gly Pro Asp Glu Pro Ala Val	Pro Ala Asn Gly Ile	Pro Asp Gly
5270	5275	5280
Ala Thr Ala Leu Thr Pro Ala	Met Leu Thr Leu Val	Asp Leu Asp
5285	5290	5295
Ala Glu Glu Ile Ala Arg Val	Val Ala Ala Val Pro	Gly Gly Ala
5300	5305	5310
Ala Asn Val Ala Asp Val Tyr	Pro Leu Ala Pro Leu	Gln Glu Gly
5315	5320	5325
Leu Leu Phe His Ser Leu Met	Asp Gly Gly Asp Asp	Val Tyr Val
5330	5335	5340
Leu Pro Ala Val Leu Gly Phe	Asp Ser Arg Ser Arg	Leu Asp Ala
5345	5350	5355
Phe Leu Ala Ala Leu Gln His	Val Ile Asp Arg His	Asp Thr Tyr
5360	5365	5370
Arg Thr Ala Val Val His Asp	Gly Leu Arg Glu Pro	Val Gln Val
5375	5380	5385
Val Trp Arg Arg Ala Thr Leu	Pro Val Glu Glu Val	Thr Leu Thr
5390	5395	5400
Ala Gly Ala Asp Pro Val Gln	Glu Leu Leu Ala Thr	Ala Pro Val
5405	5410	5415
Glu Phe Ala Leu Asp Arg Ala	Pro Leu Leu Arg Val	Arg Cys Ala
5420	5425	5430
Ala Arg Pro Asp Gly Gly Gly	Trp Leu Ala Leu Leu	Gln Ile His
5435	5440	5445
His Leu Val Gln Asp His Ala	Thr Leu Asp Ala Met	Leu Ala Glu
5450	5455	5460
Ile Gln Ala Phe Leu Ala Gly	Arg Gly Gly Glu Leu	Ala Ala Pro
5465	5470	5475
Glu Pro Phe Arg Gly Tyr Val	Ala Arg Ala Arg Leu	Ala Gly Ala
5480	5485	5490
Pro Ala Glu His Arg Ala Tyr	Phe Ser Arg Leu Leu	Gly Asp Val
5495	5500	5505
Thr Glu Ser Thr Ala Pro Tyr	Gly Leu Thr Asp Ala	Arg Asp Ala
5510	5515	5520
Arg Pro Thr Gly Lys Ala His	Arg Glu Val Asp Arg	Arg Leu Ala
5525	5530	5535
Ala Arg Val Arg Ala Thr Ala	Ser Glu Leu Gly Val	Ser Pro Ala
5540	5545	5550
Thr Val Phe His Leu Ala Trp	Ala Arg Val Leu Gly	Thr Leu Ala

5555	5560	5565
Gly Arg Asp Asp Val Val Phe 5570	Gly Thr Val Leu 5575	Leu Gly Arg Leu 5580
Gly Ala Gly Ala Arg Ser 5585	Gly Arg Ala Leu Gly 5590	Pro Phe Ile Asn 5595
Thr Leu Pro Val Arg Val 5600	Arg Leu Ala Ala Ala 5605	Gly Ser Arg Glu 5610
Thr Leu Ala Gly Leu Arg 5615	Ala Gln Leu Ala Glu 5620	Leu Ile Gly His 5625
Glu His Ala Pro Leu Thr 5630	Leu Ala Gln Ala Ala 5635	Ser Gly Val Pro 5640
Gly Gly Thr Pro Leu Phe 5645	Thr Ser Ile Leu Asn 5650	Tyr Arg Gln Gly 5655
Pro Pro Ala Gly Asp Asp 5660	Thr Gly Asp Glu Glu 5665	Ile Glu Gly Ile 5670
Glu Leu Leu Ser Thr Glu 5675	Glu Arg Ser Asn Tyr 5680	Pro Val Ala Val 5685
Ser Val Asp Asp Asp Gly 5690	Ser Gly Phe Arg Leu 5695	Thr Val Asp Ala 5700
Ala Gln Pro Ala Ala Pro 5705	Asp Arg Val Ala Glu 5710	Leu Leu His Thr 5715
Cys Leu His Arg Leu Thr 5720	Asp Ala Leu Ala Gly 5725	Thr Pro Asp Val 5730
Glu Pro Ala Arg Ile Asp 5735	Val Leu Gly Glu Ala 5740	Glu Arg Arg Glu 5745
Val Leu Arg Thr Pro Asn 5750	Ala Thr Ala Arg Asp 5755	Val Ala Ala Ala 5760
Thr Leu Pro Ala Ile Val 5765	Gly Glu Trp Ala Arg 5770	Thr Thr Pro Gly 5775
Ala Thr Ala Val Thr Ala 5780	Glu Asn Asp Arg Leu 5785	Thr Tyr Ala Glu 5790
Leu Asp Ala Arg Ala Asn 5795	Arg Leu Ala Arg Ser 5800	Leu Ile Ala Arg 5805
Gly Val Gly Pro Gly Ala 5810	Val Val Gly Met Leu 5815	Leu Pro Arg Ser 5820
Pro Gly Leu Val Val Ala 5825	Met Leu Ala Ile Val 5830	Lys Ala Gly Gly 5835
Ala Tyr Leu Pro Leu Asp 5840	Pro Gly Tyr Pro Ala 5845	Pro Arg Leu Ala 5850
Arg Met Val Glu Asp Ala 5855	Ala Pro Ala Leu Leu 5860	Leu Ala Thr Ala 5865

5855	5860	5865
Gly Thr Ala Asp Ala Val Pro Ala Gly Pro Gln Arg Leu Leu Leu	5870	5875
5885	5890	5895
Asp Asp Pro Gly Thr Ala Ala Glu Leu Ala Arg Leu Asp Gly Asp	5900	5905
5915	5920	5925
Pro Ile Arg Asp Glu Glu Arg Thr His Pro Leu Arg Pro Gly His	5930	5935
5945	5950	5955
Ser Thr Cys Leu Gln Leu Ala Pro Asp Asp Val Leu Pro His Leu	5960	5965
5975	5980	5985
Ser Ser Val Ser Phe Asp Ala Ala Thr Phe Glu Ile Trp Gly Ala	5990	6000
6005	6010	6015
Lys Leu Phe Leu Thr Thr Gly Leu Leu His Glu Val Ile Asp Ala	6020	6025
6035	6040	6045
Asp Val Leu Ser Pro Ala His Cys Arg Ser Leu Leu Asp Arg Val	6050	6055
6065	6070	6075
Thr Ile Thr Thr Leu His Arg Val Arg Pro Glu Asp Leu Asp Ala	6080	6085
6095	6100	6105
Tyr Val Leu Asp Asp Ala Leu Arg Pro Val Pro Val Gly Val Ala	6110	6115
6125	6130	6135
Gly Arg Pro Ala Pro Thr Ala Glu Arg Phe Val Ala Cys Pro Phe	6140	6145
6150		
Thr Ala Asp Gly Arg Leu Leu Phe Ala Gly Arg Ala Asp Asn Gln		

6155	6160	6165
Val Lys Ile Arg Gly Phe Arg 6170	Val Glu Pro Gly Glu Leu Glu Thr 6175	6180
Val Leu Ser Gly His Pro Ala 6185	Val Ala Arg Ala Ala Val Leu Ala 6190	6195
Arg Glu Asp Thr Pro Gly Ala 6200	Lys Arg Leu Val Ala Tyr Val Val 6205	6210
Pro Ala Arg Pro Asp Glu Asp 6215	Gly Asp Ala Leu Ala Glu Ser Val 6220	6225
Arg Ala Tyr Ala Ala Arg Gln 6230	Val Pro Asp Tyr Leu Met Pro Ala 6235	6240
Ala Thr Val Val Leu Pro Asp 6245	Leu Pro Leu Thr Ser Ser Gly Lys 6250	6255
Val Asp Arg Ala Ala Leu Pro 6260	Ala Pro Asp Val Pro Gly Gly Pro 6265	6270
Gly Arg Ala Ala Gly Thr Leu 6275	Thr Glu Glu Ile Leu Cys Gly Val 6280	6285
Phe Ala Gln Val Leu Gly Leu 6290	Pro Thr Val Gly Val Asp Asp Asp 6295	6300
Phe Phe Ala Ser Gly Gly His 6305	Ser Leu Leu Ala Thr Arg Leu Val 6310	6315
Ser Arg Leu Arg Ala Val Phe 6320	Gly Ala Glu Leu Pro Ile Arg Ala 6325	6330
Val Phe Glu Ala Pro Thr Pro 6335	Ala Thr Leu Ala Thr Arg Leu Gly 6340	6345
Ala Ser Ala Pro Arg Arg Leu 6350	Ala Leu Gly Glu Arg Ala Arg Pro 6355	6360
Glu Asn Val Pro Leu Ser Tyr 6365	Ala Gln Arg Arg Leu Trp Phe Leu 6370	6375
Asp Arg Leu Glu Gly Gln Asp 6380	Gly Thr Tyr Thr Ile Pro Leu Thr 6385	6390
Val Arg Leu Asp Gly Pro Val 6395	Asp Arg Ala Ala Leu Ala Ala Ala 6400	6405
Leu Arg Asp Val Leu Glu Arg 6410	His Glu Val Leu Arg Thr Val Phe 6415	6420
Pro Leu Val Asp Gly Glu Pro 6425	Val Gln Arg Val Leu Pro Val His 6430	6435
Asp Thr Gly Phe Thr Leu Gly 6440	Gly Gly Asp Val Ala Ala Ala Asp 6445	6450
Leu Gly Ala Ala Val Ala Glu 6455	Ala Thr Ala Gly Thr Phe Asp Leu 6460	

6455	6460	6465
Ala Ala Glu Ile Pro Val	Arg Ala Trp Leu Phe	Arg Ala Gly Pro
6470	6475	6480
Glu Asp His Thr Leu Val	Leu Leu Val His His	Val Ala Gly Asp
6485	6490	6495
Gly Trp Ser Met Thr Pro	Leu Ala Arg Asp Ile	Ala Thr Ala Tyr
6500	6505	6510
Asp Ser Arg Arg Glu Ser	Arg Ala Pro Gln Trp	Glu Pro Leu Pro
6515	6520	6525
Val Gln Tyr Ala Asp Tyr	Ala Leu Trp Gln Arg	Glu Leu Leu Gly
6530	6535	6540
Ala Glu Asp Asp Pro Glu	Ser Leu Leu Ser Arg	Gln Leu Ala Tyr
6545	6550	6555
Trp Arg Asp Ala Leu Asp	Gly Val Pro Glu Glu	Leu Asp Leu Pro
6560	6565	6570
Ala Asp Arg Pro Arg Pro	Ala Glu Ala Thr His	Arg Gly His Glu
6575	6580	6585
Val Pro Val Arg Val Pro	Ala Glu Val His Arg	Arg Leu Ala Glu
6590	6595	6600
Leu Ala Arg Ser Glu Gly	Val Thr Val Phe Met	Val Leu Gln Ala
6605	6610	6615
Ala Phe Gly Thr Leu Leu	Ser Arg Leu Gly Ala	Gly Ala Asp Ile
6620	6625	6630
Pro Ile Gly Thr Ala Val	Ala Gly Arg Thr Asp	Gln Ala Leu Asp
6635	6640	6645
Glu Leu Val Gly Phe Phe	Val Asn Thr Leu Val	Ile Arg Ala Asp
6650	6655	6660
Leu Ser Gly Asp Pro Thr	Phe Arg Glu Leu Leu	Gly Arg Val Arg
6665	6670	6675
Ala Thr Gly Leu Ser Ala	Tyr Glu His Gln Asp	Val Pro Phe Glu
6680	6685	6690
Arg Leu Val Glu Val Leu	Ala Pro Ala Arg Ser	Leu Ala Arg His
6695	6700	6705
Pro Leu Phe Gln Val Met	Leu Thr Leu Gln Asn	Thr Gly Arg Ala
6710	6715	6720
Asp Ala Gly Asp Gln Ala	Val Pro Pro Ala Ala	Gly Ser Ala Ala
6725	6730	6735
Ala Lys Phe Asp Leu Glu	Ile Ser Ile Ala Glu	Thr Phe Ala Ala
6740	6745	6750
Asp Gly Glu Pro Ala Gly	Leu Ser Gly Val Leu	Ile Ala Ala Ala

6755	6760	6765
Asp Leu Phe Glu Pro Ala 6770	Thr Ala Ala Ala Phe 6775	Ala Glu Arg Leu 6780
Ala Arg Val Leu Ala Ala 6785	Ala Gly Ala Asp Pro 6790	Arg Leu Arg Val 6795
Ser Gln Val Asp Ile Leu 6800	Ser Ala Glu Glu Arg 6805	Glu Ala Val Leu 6810
Ser Gly Gly Asn Gly Gly 6815	Thr Ala Pro Val Pro 6820	Val Thr Thr Val 6825
Pro Ala Leu Phe Ala Glu 6830	Gln Ala Arg Arg Thr 6835	Pro Gly Ala Val 6840
Ala Ala Leu Ser Glu Gly 6845	Met Ser Leu Thr Tyr 6850	Ala Asp Leu Ala 6855
Ala Arg Val Asn Arg Leu 6860	Ala Arg His Leu Val 6865	Ser Leu Gly Ala 6870
Gly Pro Glu Thr Val Val 6875	Gly Ile Ala Met Ser 6880	Arg Gly Leu Asp 6885
Met Leu Val Ala Val Leu 6890	Ala Val Gly Gln Ala 6895	Gly Ala Ala Tyr 6900
Leu Pro Val Asp Pro Ser 6905	Tyr Pro Asp Glu Arg 6910	Lys Glu Phe Met 6915
Leu Thr Asp Ala Gly Ala 6920	Ala Tyr Val Leu Thr 6925	Leu Ala Ser Asp 6930
Ala Asp Arg Val Pro Pro 6935	Gly Thr Pro Ala Ala 6940	Ala Val Val Leu 6945
Asp Glu Pro Val Thr Ala 6950	Ala Arg Ile Ala Gly 6955	Leu Asp Pro Ala 6960
Asp Leu Thr Asp Ala Asp 6965	Arg Val Ala Pro Leu 6970	Leu Pro Ala His 6975
Arg Ala Tyr Val Ile Tyr 6980	Thr Ser Gly Ser Thr 6985	Gly Arg Pro Lys 6990
Gly Val Ala Val Glu His 6995	Arg Thr Val Val Asn 7000	Leu Leu Ser Trp 7005
Ala Ala Gly Arg Phe Gly 7010	Gly Ala Asp Phe Ala 7015	Arg Thr Leu Ala 7020
Ala Thr Ser Leu Asn Phe 7025	Asp Val Ser Val Phe 7030	Glu Ile Phe Gly 7035
Pro Leu Val Ser Gly Gly 7040	Ser Ile Glu Ile Val 7045	Thr Asp Leu Leu 7050
Ala Leu Ala Asp Pro Ala 7055	Ser Pro Ala Trp Glu 7060	Ala Ser Leu Val 7065

7055					7060					7065				
Ser	Gly	Val	Pro	Ser	Ala	Phe	Ser	Arg	Val	Leu	Asp	Arg	Gly	Asp
7070						7075					7080			
Ile	Ala	Ala	Arg	Thr	Arg	Ser	Val	Val	Leu	Ala	Gly	Glu	Ala	Leu
7085						7090					7095			
Thr	Ala	Asp	Val	Val	Asn	Ala	Thr	Arg	Ala	Ala	Leu	Pro	Gly	Val
7100						7105					7110			
Arg	Val	Ala	Asn	Ile	Tyr	Gly	Pro	Thr	Glu	Ala	Thr	Val	Tyr	Ser
7115						7120					7125			
Thr	Ala	Trp	His	Thr	Asp	Arg	Asp	Val	Thr	Gly	Gly	Ala	Ala	Pro
7130						7135					7140			
Ile	Gly	Arg	Pro	Val	Thr	Asn	Thr	Arg	Ala	Tyr	Val	Leu	Asp	Asp
7145						7150					7155			
Arg	Leu	Thr	Pro	Val	Pro	Pro	Gly	Val	Val	Gly	Glu	Leu	Tyr	Leu
7160						7165					7170			
Ala	Gly	Ala	Gln	Leu	Ala	Arg	Gly	Tyr	Leu	Gly	Arg	Pro	Gly	Leu
7175						7180					7185			
Thr	Gly	Glu	Arg	Phe	Val	Ala	Cys	Pro	Phe	Gly	Pro	Gly	Gly	Glu
7190						7195					7200			
Arg	Met	Tyr	Arg	Thr	Gly	Asp	Arg	Val	Arg	Trp	Asn	Ala	Asp	Gly
7205						7210					7215			
Asp	Leu	Val	Phe	Ala	Gly	Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg
7220						7225					7230			
Gly	Phe	Arg	Ile	Glu	Pro	Gly	Glu	Val	Gln	Ala	Val	Val	Ala	Arg
7235						7240					7245			
Gln	Ala	Gly	Val	Ala	Arg	Ala	Val	Val	Leu	Ala	Arg	Ser	Asp	Ser
7250						7255					7260			
Pro	Gly	Asp	Ala	Arg	Leu	Val	Ala	Tyr	Val	Val	Pro	Ala	Asp	Arg
7265						7270					7275			
Asp	Ala	Asp	Arg	Arg	Ala	Leu	Ala	Ala	Thr	Val	Arg	Ser	Asp	Thr
7280						7285					7290			
Ala	Arg	Glu	Leu	Pro	Ala	Tyr	Leu	Val	Pro	Ala	Ala	Val	Val	Val
7295						7300					7305			
Leu	Asp	Glu	Leu	Pro	Val	Thr	Ala	Asn	Gly	Lys	Leu	Asp	Arg	Arg
7310						7315					7320			
Ala	Leu	Pro	Ala	Pro	Gly	Leu	Ala	Glu	Ala	Gly	Ser	Gly	Arg	Gly
7325						7330					7335			
Pro	Val	Thr	His	Arg	Glu	Glu	Val	Leu	Cys	Glu	Val	Phe	Ala	Gln
7340						7345					7350			
Val	Leu	Gly	Leu	Pro	Ser	Val	Gly	Val	Asp	Asp	Asp	Phe	Phe	Ala

7355		7360		7365
Leu Gly Gly His Ser Leu	Leu Ala Val Ser Leu	Val Glu Gln Leu		
7370	7375	7380		
Arg Arg Arg Gly Val Thr	Val Gly Val Arg Ala	Leu Phe Gln Thr		
7385	7390	7395		
Pro Thr Val Ala Gly Leu	Ala Glu Ala Ala Ala	Pro Thr Thr Val		
7400	7405	7410		
Ala Val Pro Pro Asn Leu	Ile Pro Glu Asp Ala	Arg His Ile Thr		
7415	7420	7425		
Pro Gly Leu Leu Pro Leu	Val Glu Leu Glu Gln	Ala Glu Ile Asp		
7430	7435	7440		
Gln Val Val Ala Thr Val	Asp Gly Gly Ala Ala	Asn Val Ala Asp		
7445	7450	7455		
Ile Tyr Pro Leu Ala Pro	Leu Gln Gln Gly Met	Leu Phe His His		
7460	7465	7470		
Leu Met Ala Gly Asp Asp	Gly Glu Asp Val Tyr	Ile Met Pro Ala		
7475	7480	7485		
Val Val Glu Phe Asp Ser	Ala Asp Arg Phe Gly	Ala Phe Val Asp		
7490	7495	7500		
Ala Leu Gln His Val Ile	Asp Arg Asn Asp Val	Tyr Arg Thr Gly		
7505	7510	7515		
Val Val Trp Asp Gly Leu	Arg Glu Pro Val Gln	Val Val Trp Arg		
7520	7525	7530		
Arg Ala Pro Leu Pro Val	Thr Glu Val Thr Leu	Asp Pro Ala Gly		
7535	7540	7545		
Gly Asp Pro Ala Ala Gln	Leu His Ala Ala Ala	Gly Ala Arg Met		
7550	7555	7560		
Asp Leu Asn Arg Ala Pro	Leu Leu Asp Leu His	Val Ala Ala Arg		
7565	7570	7575		
Pro Glu Asp Gly Gln Arg	Leu Ala Leu Leu Arg	Val His His Met		
7580	7585	7590		
Val Gln Asp His Met Gly	Leu Glu Val Leu Leu	Gly Glu Val Gln		
7595	7600	7605		
Ala Phe Leu Ala Gly Arg	Gly Asp Glu Leu Pro	Asp Pro Leu Pro		
7610	7615	7620		
Phe Arg Asp Phe Val Ala	Gln Thr Arg Gly Gly	Val Pro Glu Ala		
7625	7630	7635		
Glu His Arg Arg Phe Phe	Ala Gly Leu Leu Gly	Asp Val Thr Glu		
7640	7645	7650		
Pro Thr Ala Pro Tyr Gly	Leu Leu Asp Val His	Arg Asp Gly Val		

7655		7660		7665
Gly Leu Val Arg Gln Glu Arg Pro Leu Asp Gly Glu Val Val Ala				
7670		7675		7680
Arg Leu Arg Ala Val Ala Arg Arg Leu Gly Val Ser Pro Ala Thr				
7685		7690		7695
Val Met His Val Ala Trp Ala Arg Val Leu Gly Val Ile Ser Gly				
7700		7705		7710
Arg Asp Asp Val Val Phe Gly Thr Leu Leu Leu Gly Arg Phe Ser				
7715		7720		7725
Thr Gly Ala Asp Arg Val Pro Gly Pro Phe Ile Asn Thr Leu Pro				
7730		7735		7740
Val Arg Ala Arg Leu Gly Gly Thr Gly Ala Ala Ala Ala Val Ala				
7745		7750		7755
Glu Met Arg Arg Leu Leu Ala Glu Leu Leu Glu His Glu His Ala				
7760		7765		7770
Pro Leu Thr Thr Ala Gln Gln Ala Ser Gly Leu Ser Gly Asn Leu				
7775		7780		7785
Pro Leu Phe Thr Ala Leu Phe Asn Tyr Arg His Asn Thr Ser Pro				
7790		7795		7800
Gly Ala Asp Pro Ser Pro Ala Ala Gly Pro Thr Glu Gly Ile Arg				
7805		7810		7815
Pro Val Ser Met Arg Glu Arg Thr Asn Tyr Pro Ile Ser Val Ala				
7820		7825		7830
Val Asp Asp Asp Gly Glu Gly Leu Gly Val Ala Val Asn Ala Ile				
7835		7840		7845
Pro Pro Val Arg Pro Glu Ala Val Cys Glu Leu Val Ala Thr Ala				
7850		7855		7860
Thr Glu Ser Leu Thr Ser Ala Leu Glu Leu Phe Leu Asp Gly Gly				
7865		7870		7875
Pro Asp Thr Ala Val Gly Glu Leu Asp Val Leu Pro Pro Gly Glu				
7880		7885		7890
Arg Ser Arg Leu Leu Val Glu Trp Asn Asp Thr Ala Arg Pro Val				
7895		7900		7905
Val Glu Ser Ser Val Pro Ala Leu Phe Ala Glu Arg Val Ala Ala				
7910		7915		7920
Ala Pro Asp Ala Val Ala Val Val Gly Glu Gly Val Ser Trp Ser				
7925		7930		7935
Tyr Arg Glu Leu Asp Arg Arg Ser Asp Val Leu Ala Arg Ser Leu				
7940		7945		7950
Val Ala Ala Gly Val Gly Leu Glu Ser Pro Val Val Val Ala Leu				

7955					7960					7965				
Glu	Arg	Ser	Ala	Asp	Val	Leu	Thr	Ala	Phe	Leu	Ala	Val	Ala	Lys
7970					7975					7980				
Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp	Pro	Gln	Thr
7985					7990					7995				
Arg	Ile	Asp	Ala	Val	Ile	Ala	Asp	Ser	Arg	Pro	Val	Leu	Val	Leu
8000					8005					8010				
Asp	Ser	Val	Asp	Leu	Pro	Ala	Ala	Glu	Ala	Asp	Leu	Pro	Arg	Val
8015					8020					8025				
Pro	Ala	Gly	Ala	Gly	Val	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr
8030					8035					8040				
Gly	Arg	Pro	Lys	Gly	Val	Val	Thr	Thr	His	Gln	Asn	Leu	Val	Asp
8045					8050					8055				
Leu	Ala	Thr	Asp	Thr	Cys	Trp	Gly	Ser	Thr	Pro	Arg	Val	Leu	Phe
8060					8065					8070				
His	Ala	Pro	His	Ala	Phe	Asp	Ala	Ser	Ser	Tyr	Glu	Ile	Trp	Val
8075					8080					8085				
Pro	Leu	Leu	Asn	Gly	Gly	Thr	Val	Val	Val	Ala	Pro	Arg	Arg	Ser
8090					8095					8100				
Ile	Asp	Ala	Thr	Val	Leu	Arg	Asp	Leu	Val	Arg	Gly	His	Glu	Leu
8105					8110					8115				
Thr	His	Val	His	Val	Thr	Ala	Gly	Leu	Leu	Arg	Val	Leu	Asp	Pro
8120					8125					8130				
Ser	Cys	Phe	Ala	Gly	Leu	Thr	Glu	Val	Leu	Thr	Gly	Gly	Asp	Ala
8135					8140					8145				
Val	Ser	Ala	Glu	Ala	Val	Arg	Arg	Val	Lys	Glu	Ala	Asn	Pro	Gly
8150					8155					8160				
Leu	Arg	Val	Arg	Gln	Leu	Tyr	Gly	Pro	Thr	Glu	Val	Thr	Leu	Cys
8165					8170					8175				
Ala	Thr	Gln	His	Leu	Leu	Asp	Asp	Gly	Val	Pro	Ile	Gly	Arg	Pro
8180					8185					8190				
Leu	Asp	Asn	Thr	Arg	Val	Tyr	Val	Leu	Asp	Asp	Leu	Leu	Arg	Pro
8195					8200					8205				
Val	Pro	Thr	Gly	Val	Val	Gly	Glu	Leu	Tyr	Val	Ala	Gly	Ser	Gly
8210					8215					8220				
Leu	Ala	Arg	Gly	Tyr	Ala	Gly	Met	Pro	Gly	Leu	Thr	Ala	Glu	Arg
8225					8230					8235				
Phe	Val	Ala	Asp	Pro	Phe	Ser	Val	Gly	Gly	Arg	Leu	Tyr	Arg	Thr
8240					8245					8250				
Gly	Asp	Leu	Val	Arg	Trp	Thr	Asp	Asp	Gly	Val	Leu	His	Phe	Ala

8255		8260		8265
Gly Arg Ala Asp Asp Gln Val Lys Ile Arg Gly Tyr Arg Val Glu				
8270		8275		8280
Pro Gly Glu Val Glu Ala Val Leu Ala Gln His Pro Asp Val Ser				
8285		8290		8295
Gln Val Ala Val Val Val Arg Glu Asp Ala Pro Gly Asp Lys Arg				
8300		8305		8310
Leu Val Ala Tyr Val Val Gly Gly Asp Val Glu Ala Tyr Ala Gln				
8315		8320		8325
Glu Arg Leu Pro Gly Tyr Met Val Pro Ser Ala Phe Val His Leu				
8330		8335		8340
Glu Ala Leu Pro Leu Thr Ala Asn Gln Lys Val Asp Arg Ala Ala				
8345		8350		8355
Leu Pro Ala Pro Glu Arg Glu Thr Thr Thr Pro Gly Lys Ala Pro				
8360		8365		8370
Ala Pro Gly Pro Leu Gly Asn Leu Glu Glu Ser Met Cys Gln Ala				
8375		8380		8385
Phe Ala Glu Val Leu Gly Leu Asp Ser Val Gly Pro Asp Asp Asp				
8390		8395		8400
Phe Phe Ala Leu Gly Gly His Ser Leu Leu Ala Val Ala Leu Val				
8405		8410		8415
Gln Arg Leu Lys Ala Arg Gly Val Ala Val Thr Val Gln Asp Ile				
8420		8425		8430
Met Ala Ala Pro Thr Val Ser Glu Leu Met Gly Ser Leu Ser Met				
8435		8440		8445
Ser Ser Ile Arg Asp Ser Leu Gly Thr Leu Leu Pro Ile Arg Arg				
8450		8455		8460
Thr Gly Glu Leu Pro Pro Leu Phe Cys Val His Pro Ala Gly Gly				
8465		8470		8475
Leu Ser Trp Cys Tyr Leu Pro Leu Ala Arg His Val Pro Ala Asp				
8480		8485		8490
Arg Pro Ile Tyr Gly Leu Gln Ala Arg Gly Ala Asp Gly Arg Glu				
8495		8500		8505
Pro Leu Ala Pro Ser Leu Arg Glu Met Ala Ala Asp Tyr Val Ser				
8510		8515		8520
Arg Met Arg Ala Val Gln Pro Glu Gly Pro Tyr His Val Leu Gly				
8525		8530		8535
Phe Ser Phe Gly Val Ala Pro Ala His Glu Ile Ala Val Gln Leu				
8540		8545		8550
Arg Glu Gln Gly Ala Glu Val Val Leu Val Leu Met Asp Ser Tyr				

8555	8560	8565
Pro Met Glu Asp Ala Glu Ser Gly Glu Gln Ala Ala Asp Glu Glu		
8570	8575	8580
Glu Leu Pro Trp Glu Glu Leu Ile Glu Ala Glu Phe Gly Arg Val		
8585	8590	8595
Leu Gly Gly Phe Ser Arg Asp Glu Leu Ala Ala Phe Ala Ala Val		
8600	8605	8610
Phe Arg Asn Asn Thr Lys Ile Arg Ala Arg His Arg Leu Gly Arg		
8615	8620	8625
Phe Asp Gly Asp Ala Leu Leu Ile Ala Ser Thr Asp Ser Ala Pro		
8630	8635	8640
Asp Gly Glu Ser Asn Thr Trp Arg Trp Ala Pro Tyr Ile Thr Gly		
8645	8650	8655
Glu Ile Thr Gln Val Val Leu Pro Cys Glu His Thr Asp Leu Val		
8660	8665	8670
Arg Pro Asp Met Leu Ala Leu Leu Trp Pro Ala Val Glu Ala Trp		
8675	8680	8685
Gln Ala Gly Arg His Arg Pro		
8690	8695	

<210> 16
 <211> 234
 <212> PRT
 <213> Actinoplanes sp.

<400> 16

Met Gln Lys Ile Pro Leu Val Cys Val Pro Phe Ala Gly Ala Gly Ala		
1	5	10
Ser Phe Phe His Pro Trp Ala Glu Leu Ala Gly Pro Asp Arg Pro Ile		
20	25	30
Val Ala Leu Gln Leu Pro Gly Arg Glu Trp Arg Leu Leu Asp Glu Pro		
35	40	45
Tyr Ala Asp Val Val Ala Ala Ala Ala Asp Leu Ala Leu Thr Val Ala		
50	55	60
Asp Glu Val Gly Ala Gly Gly Arg Val Ala Leu Phe Gly His Ser Leu		
65	70	75
Gly Ala Val Leu Ala Tyr Glu Ile Ala His Ala Leu Val Arg Asp Gly		
85	90	95
Glu Val Gly Val Glu Arg Leu Phe Val Ser Gly Ser Pro Asp Pro Trp		
100	105	110
Thr Pro Arg Thr Asn Arg Ala Ser Gly Leu Asp Asp Glu Glu Phe Leu		
115	120	125

Leu Arg Val Arg Glu Phe Ala Gly Tyr Asp His Glu Ala Leu Ala Asp
 130 135 140
 Pro Asp Met Arg Glu Leu Ile Leu Pro Ala Leu Arg Ala Asp Val Glu
 145 150 155 160
 Met His Glu Ser Tyr Val Ala Gly Ser Ala Asp Pro Leu Pro Ala Pro
 165 170 175
 Val Thr Ala Leu His Ala Arg Asp Asp Ala Leu Val Ser Ala Glu Gln
 180 185 190
 Thr Ala Gly Trp Ser Lys Ala Thr Ser Gly Pro Phe Gln Leu Val Glu
 195 200 205
 Val Asp Gly Gly His Met Tyr Leu Thr Glu Asp Pro Ala Gly Leu Leu
 210 215 220
 Arg Leu Ile Ala Ala Asp Leu Asp Arg Asp
 225 230

<210> 17

<211> 274

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue at
 this position

<400> 17

Val Arg Leu Thr Gly Lys Thr Ala Ile Val Thr Gly Ala Ala Arg Gly
 1 5 10 15
 Leu Gly Arg Ala Cys Ala Val Ala Phe Ala Ala Glu Gly Ala Asp Leu
 20 25 30
 Val Leu Leu Asp Arg Ala Ala Asp Leu Pro Gly Val Pro Tyr Pro Leu
 35 40 45
 Gly Thr Val Gly Gln Leu Glu His Thr Ala Asp Leu Cys Arg Lys Gln
 50 55 60
 Gly Ala Ala Val Leu Thr Val Arg Ala Asp Val Arg Asp Leu Ala Ala
 65 70 75 80
 Leu Thr Ala Ala Ala Asp Arg Ala Ile Asp Arg Phe Gly Gly Ile Asp
 85 90 95
 Val Leu Val Asn Asn Ala Gly Ile Ala Ala Pro Ser Gly Lys Val Thr
 100 105 110
 His Glu Ile Thr Glu Asp Glu Trp Gln Leu Met Ile Asp Val Asp Leu
 115 120 125

Ser Gly Ala Trp Arg Met Thr Ala Ala Val Gly Arg His Met Thr Glu
 130 135 140
 Arg Arg Ser Gly Ser Ile Val Asn Ile Ala Ser Thr Ala Gly Gln Val
 145 150 155 160
 Gly Tyr Arg His Phe Ala Gly Tyr Val Ala Ala Lys His Gly Ile Val
 165 170 175
 Gly Leu Thr Arg Ala Ala Ala Leu Asp Tyr Ala Pro Ala Lys Val Arg
 180 185 190
 Val Asn Ala Val Cys Pro Gly Ser Val Arg Asp Asp Pro Gln Phe Glu
 195 200 205
 Gly Arg Met Leu Ser Glu Ile Ala Arg Ser Leu Asp Val Pro Val Ala
 210 215 220
 Glu His Glu Gln Thr Phe Leu Gln Ala Gln Pro Met Asn Ala Leu Ile
 225 230 235 240
 Glu Pro Asp Asp Val Ala Asn Ala Ala Ile Trp Leu Ala Ser Asp Glu
 245 250 255
 Ser Arg Gln Val Thr Gly Ser Val Val Thr Val Asp Gly Gly Phe Thr
 260 265 270

Thr Arg

<210> 18
 <211> 891
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V is a non-standard initiator codon. It is expected that the bio
 synthesized protein will have a formylmethionine residue at this
 position

<400> 18

Val Pro Lys Ser Gln Pro Ala Thr Arg Thr Ala Ala Pro Gly Ala Ala
 1 5 10 15
 Glu Cys His Ala Leu Ala Val Arg Leu Ala Gly Pro Ile Asp Pro Ala
 20 25 30
 Pro Ile Glu Arg Arg Leu Ala Ala Arg Met Pro Phe Trp His Glu His
 35 40 45
 Val Ala Ala Arg Pro Gly Asp Glu Ala Ala Leu Arg Arg Arg Glu Arg
 50 55 60
 Glu Leu Ala Arg Pro Val Pro Pro Glu Pro Gly Ala Arg Ala Val Leu
 65 70 75 80

Leu Ala Tyr Ala Asp Gly Ser Ala Asp Leu Val Leu Val Ala Arg Arg
 85 90 95
 Asp Arg Leu Asp Arg Asp Ala Leu Ile Ala Leu Ala Arg Pro Glu Arg
 100 105 110
 Ala Pro Arg Gly Arg Lys Pro Ala Glu Pro Asp Ala Pro Pro Pro Ser
 115 120 125
 Ala Ala Pro Ala Trp Gly Leu Gly Asp Gly Gly Pro Asp Asp Arg Trp
 130 135 140
 Ala Glu Leu Arg Val Pro Ala Arg Gly Pro Ala Asp Pro Ala Arg Trp
 145 150 155 160
 Pro Ala Ala Leu Ala Lys Val Leu Ala Arg Tyr Glu Pro Gly Ala Ala
 165 170 175
 Ala Gly Ser Gly Ala Ala Ala Gly Leu Gly Ala Ala Ala Gly Ser Gly
 180 185 190
 Val Ala Ala Gly Ser Ser Ala Ala Ser Gly Ser Gly Ala Ala Ala Val
 195 200 205
 Pro Gly Pro Val Ala Leu Ala Phe Asp Gly Asp Leu Ala Pro Pro Asp
 210 215 220
 Glu Tyr Val Pro Phe Leu Ala Pro Thr His Pro Leu Thr Val Gln Val
 225 230 235 240
 Ser Arg Thr Pro Gly Gly Gly Thr Glu Leu Arg Cys Arg His Arg Leu
 245 250 255
 Gly Ala Val Ser Pro Ala Ala Ala Glu Ala Phe Ala Arg Met Leu Ala
 260 265 270
 Ala Ala His Gly Glu Pro Pro Ala Asp Asp Gly Ala Thr Ala Glu Pro
 275 280 285
 Thr Pro Pro Ala Ala Pro Ala Pro Ala Pro Ala Pro Ala Pro Ala Pro
 290 295 300
 Pro Ala Ala Ala Arg Thr Leu Thr Gly Leu Phe Ala Glu Gln Val Ala
 305 310 315 320
 Ala Arg Pro Thr Ala Val Ala Val Ser Asp Asp Arg Gly Arg His Thr
 325 330 335
 Tyr Arg Glu Leu Asp Glu Trp Ser Gly Arg Leu Ala Arg Gly Leu Arg
 340 345 350
 Lys Ala Gly Val Arg Asp Gly Asp Ala Val Gly Val Cys Leu Asp Arg
 355 360 365
 Ser Ala Glu Leu Val Ala Val Leu Leu Ala Val Leu Lys Ala Gly Ala
 370 375 380
 Ala Tyr Val Pro Leu Asp Ala Ala Tyr Pro Ala Asp Arg Ile Ala Tyr
 385 390 395 400

Thr	Val	Gly	Asp	Ala	Gly	Leu	Ala	Val	Val	Val	Thr	Thr	Ser	Ala	Asp	405	410	415
Phe	Pro	Asp	Val	Asp	Gly	Val	Arg	Leu	Leu	Ala	Pro	Glu	Ser	Leu	Ala	420	425	430
Glu	Ala	Gly	Asp	Asp	Pro	Gly	Ile	Pro	Leu	Ala	Thr	Pro	Ala	Gly	Pro	435	440	445
Glu	Arg	Pro	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg	Pro	450	455	460
Lys	Gly	Val	Val	Val	Pro	His	Ala	Asn	Val	Ser	Ala	Leu	Leu	Asp	Ala	465	470	475
Thr	Arg	Glu	Glu	Tyr	Ala	Leu	Gly	Pro	Gly	Asp	Val	Trp	Thr	Phe	Phe	485	490	495
His	Ser	Ala	Ala	Phe	Asp	Phe	Ser	Val	Trp	Glu	Ile	Trp	Gly	Cys	Leu	500	505	510
Leu	Thr	Gly	Gly	His	Leu	Val	Val	Val	Pro	Tyr	Trp	Val	Ser	Arg	Ser	515	520	525
Pro	Glu	Gln	Phe	His	Asp	Leu	Leu	Ala	Glu	Arg	Gly	Val	Thr	Val	Leu	530	535	540
Asn	Gln	Thr	Pro	Ser	Ser	Phe	Thr	Gln	Leu	Val	Ala	Ala	Asp	Arg	Gly	545	550	555
Ala	Glu	Arg	Asp	Leu	Ala	Val	Arg	Leu	Val	Ile	Phe	Gly	Gly	Glu	Pro	565	570	575
Leu	Asp	Ala	Arg	Thr	Val	Leu	Pro	Trp	Leu	Asp	Arg	Arg	Pro	Glu	Ala	580	585	590
Arg	Cys	Arg	Leu	Val	Asn	Met	Phe	Gly	Ile	Thr	Glu	Thr	Thr	Val	His	595	600	605
Val	Thr	Ala	Val	Asp	Val	Thr	Arg	Ala	Ala	Ala	Leu	Ala	Gly	Ser	Arg	610	615	620
Ser	Val	Gly	Arg	Pro	Leu	Pro	Gly	Trp	Ala	Val	Arg	Val	Leu	Asp	Glu	625	630	635
Gln	Arg	Arg	Glu	Val	Pro	Pro	Gly	Val	Pro	Gly	Glu	Ile	Tyr	Val	Gly	645	650	655
Gly	Ala	Gly	Val	Ala	Ile	Gly	Tyr	Leu	Asn	Arg	Pro	Glu	Leu	Thr	Ala	660	665	670
Glu	Arg	Phe	Val	Thr	Gly	Pro	Asp	Gly	Arg	Arg	Trp	Tyr	Arg	Ser	Gly	675	680	685
Asp	Arg	Gly	Arg	Leu	Leu	Pro	Asp	Gly	Thr	Leu	Glu	His	Leu	Gly	Arg	690	695	700
Leu	Asp	Asp	Gln	Val	Lys	Leu	Arg	Gly	Phe	Arg	Ile	Glu	Leu	Asp	Glu	705	710	715

Ile Arg Gly Val Leu Thr Glu Cys Ala Gly Val Ala Ala Ala Val
 725 730 735
 Val Ile Arg Arg Ser Thr Pro Asp Asp Pro Ala Thr Ala Arg Leu Asp
 740 745 750
 Ala Tyr Val Val Ala Glu Ala Gly Ala Thr Pro Pro Val Ala Glu His
 755 760 765
 Ala Ala Arg Met Leu Pro Ala Tyr Met Cys Pro Ala Thr Phe Thr Phe
 770 775 780
 Leu Asp Ala Leu Pro Met Thr Pro Asn Gly Lys Val Asp Lys Ala Ala
 785 790 795 800
 Leu Pro Glu Pro Ala Arg Pro Ala Ala Asp Ala Ala Ala Thr Pro Ala
 805 810 815
 Gly Pro Gly Glu Asp Gly Leu Ala Gly Asp Leu Ala Asp Val Trp Gln
 820 825 830
 Gln Val Phe Gly Cys Pro Val Thr Val Ser Asp Asn Phe Phe Asp Leu
 835 840 845
 Gly Gly Asn Ser Leu Leu Ala Val Arg Met Ala Ala Leu Met Arg Arg
 850 855 860
 Arg Gly Leu Pro Arg Leu His Pro Arg Thr Leu Tyr Leu His Pro Thr
 865 870 875 880
 Val Arg Gly Leu Ala Asp Ala Leu Arg Ser Ala
 885 890

<210> 19
 <211> 187
 <212> PRT
 <213> Actinoplanes sp.

<400> 19

Met Arg Asn Leu Arg Arg Thr Thr Gly Ile Gly Leu Leu Ala Leu Leu
 1 5 10 15
 Ser Val Ala Ala Cys Ser Ser Thr Pro Ala Ala Ser Glu Pro Pro Pro
 20 25 30
 Ser Ala Ala Pro Pro Ser Ala Val Thr Ala Thr Gly Pro Ala Ala Glu
 35 40 45
 Lys Ala Val Lys Ser Gly Thr Gln Thr Tyr His Gln Ala Leu Asp Ala
 50 55 60
 Phe Val Ala Ala Ser Asn Lys Gly Thr Thr Asp Thr Thr Glu Ile Gly
 65 70 75 80
 Lys Tyr Ala Ser Gly Arg Ala Leu Met Thr Phe Gln Gly Ile Leu Ala
 85 90 95
 Ser Tyr Gln Gln Gln Gly Val His Thr Ser Gly Glu Pro Arg Ile Asp
 100 105 110

Glu Pro Val Val Thr Gly Leu Thr Pro Pro Ala Asp Pro Thr Gly Val
 115 120 125
 Gln Leu Arg Gly Cys Ile Asp Ile Ser Ala Trp Pro Leu Thr Lys Ala
 130 135 140
 Asp Gly Thr Pro Ala Asp Lys Val Gly Gly Gln Gln Gly Ser Gly Pro
 145 150 155 160
 Ser Ala Ile Leu Ala Asn Val Ala Arg Ser Gly Ala Thr Trp Gln Val
 165 170 175
 Thr Glu Leu Ala Ile Gln Gly Pro Cys Ala Ala
 180 185

<210> 20
 <211> 415
 <212> PRT
 <213> Actinoplanes sp.
 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 20

Val Thr Val Arg Arg Trp Leu Pro Ala Gly Leu Thr Val Leu Ala Phe
 1 5 10 15
 Ala Ala Gly Phe Trp Gln Lys Leu Pro Cys Gln Ala Ala Gly Trp Pro
 20 25 30
 Asp Asp Thr Ala Thr Leu Phe Gly Arg Tyr Cys Tyr Ser Asp Val Pro
 35 40 45
 Ile Leu Phe Arg Glu Arg Gly Leu Phe Asp Gly Ile Phe Pro Tyr Glu
 50 55 60
 Ser Gly Pro Gly Ala Gln Pro Leu Glu Tyr Pro Val Leu Thr Gly Tyr
 65 70 75 80
 Leu Met Asp Ala Thr Ala Arg Leu Val Arg Ala Ile Leu Pro Gly Ala
 85 90 95
 Asp Val Ala Val Ala Ser Arg Ala Tyr Phe Leu Thr Thr Val Leu Val
 100 105 110
 Leu Leu Ala Leu Ala Val Leu Thr Val Trp Ala Thr Gly Ala Val Leu
 115 120 125
 Arg Arg Thr Gly Gly Arg Pro Gly Asp Ala Leu Leu Val Ala Ala Ala
 130 135 140
 Pro Val Leu Ile Leu Ala Gly Thr Val Asn Trp Asp Leu Leu Ala Val
 145 150 155 160

Ala Ala Ala Val Leu Ala Ile Leu Ala Trp Glu Arg Asp Arg Pro Leu
 165 170 175
 Leu Ala Gly Val Leu Ile Gly Leu Gly Thr Ala Ala Lys Leu Phe Pro
 180 185 190
 Leu Val Leu Leu Gly Pro Val Leu Leu Leu Cys Leu Arg Gln Arg Arg
 195 200 205
 Met Arg Arg Phe Ala Arg Val Ala Ala Gly Ala Ala Gly Ala Trp Leu
 210 215 220
 Leu Val Asn Leu Pro Val Val Ala Leu Gln Pro Asp Gly Trp Met Glu
 225 230 235 240
 Phe Trp Arg Phe Asn Ala Gly Arg Gly Ala Glu Phe Gly Ser Leu Trp
 245 250 255
 Phe Ala Leu Asp Gly Leu Gly Leu His Met Pro Ala Val Asn Ala Val
 260 265 270
 Ala Leu Ala Thr Phe Gly Val Leu Leu Ala Gly Ile Ala Val Leu Ala
 275 280 285
 Leu Arg Ser Arg Arg Pro Pro Asp Leu Ala Gln Leu Ala Cys Leu Ala
 290 295 300
 Val Gly Ala Phe Leu Leu Thr Asn Lys Val Tyr Ser Pro Gln Tyr Ala
 305 310 315 320
 Leu Trp Leu Leu Pro Leu Val Val Ile Ala Arg Gly Arg Val Pro Arg
 325 330 335
 Trp Pro Val Val Arg Asp Trp Ala Val Trp Gln Ala Ala Glu Val Leu
 340 345 350
 Tyr Trp Leu Ala Val Trp Ser Trp Leu Ala Gly Ser Leu Thr Asp Glu
 355 360 365
 Arg Gln Tyr Ala Trp Ala Thr Val Leu Arg Val Leu Ala Thr Ala Tyr
 370 375 380
 Val Cys Gly Gln Val Val Trp Asp Val Leu Ala Ala Pro Arg Pro His
 385 390 395 400
 Arg Pro Ala Pro Pro Pro Ala Val Ala Glu Pro Ala His Pro Gly
 405 410 415

<210> 21

<211> 491

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 21

Val Ala Ala Gln Pro Glu Glu Phe Asp Val Ile Val Val Gly Gly Gly
1 5 10 15
Pro Gly Gly Ser Thr Ala Ala Ala Leu Thr Ala Lys Gln Gly Ala Lys
20 25 30
Val Leu Leu Leu Glu Arg Glu Lys Phe Pro Arg Tyr Gln Ile Gly Glu
35 40 45
Ser Leu Leu Pro Ser Thr Val His Gly Val Cys Asn Leu Leu Gly Val
50 55 60
Gly Asp Glu Ile Ala Lys Ala Gly Phe Met Arg Lys His Gly Gly Thr
65 70 75 80
Phe Lys Trp Gly Thr Ser Thr Glu Pro Trp Thr Phe Thr Phe Ala Thr
85 90 95
Ser Pro Arg Met Ala Gly Pro Thr Ser His Ala Phe Gln Val Glu Arg
100 105 110
Arg Arg Phe Asp Gln Ile Leu Leu Glu Asn Ala Arg Arg Leu Gly Val
115 120 125
Asp Val Arg Glu Asn His Pro Val Thr Glu Ala Ile Ala Asp Asp Glu
130 135 140
Arg Val Arg Gly Val Arg Phe Thr Gln Asp Gly Gln Thr Arg Thr Ala
145 150 155 160
Leu Ala Arg Phe Val Val Asp Ala Ser Gly Asn Arg Ser Thr Leu His
165 170 175
Thr Thr Val Gly Gly Thr Arg Glu Tyr Ser Pro Phe Phe Arg Asn Leu
180 185 190
Ala Leu Phe Gly Tyr Phe Glu Asn Gly Arg Arg Leu Pro Ala Pro Asn
195 200 205
Ser Gly Asn Ile Leu Cys Val Ala Phe Gly Ser Gly Trp Phe Trp Tyr
210 215 220
Ile Pro Leu Ser Glu Thr Leu Thr Ser Val Gly Ala Val Val Arg Arg
225 230 235 240
Glu Met Ala His Lys Val Gln Gly Asp Gln Glu Lys Ala Leu Phe Glu
245 250 255
Leu Ile Ala Glu Cys Pro Met Ile Ala Asp Phe Leu Gly Asp Ala Thr
260 265 270
Arg Val Thr Glu Gly Asp Tyr Gly Gln Ile Arg Val Arg Lys Asp Tyr
275 280 285
Ser Tyr Ser Ser Thr Ser Tyr Trp Arg Pro Gly Met Cys Leu Val Gly
290 295 300

Asp Ala Ala Cys Phe Ile Asp Pro Val Phe Ser Ser Gly Val His Leu
 305 310 315 320
 Ala Thr Tyr Ser Gly Leu Leu Ala Ala Arg Ser Ile Asn Ser Val Leu
 325 330 335
 Ala Gly Thr Val Asp Glu Asp Arg Ala Phe Thr Glu Phe Glu Gln Arg
 340 345 350
 Tyr Arg Arg Glu Phe Gly Val Phe His Asp Phe Leu Val Ser Phe Tyr
 355 360 365
 Asp Met His Val Asp Glu Ser Ser Tyr Phe Trp Ala Ala Arg Lys Val
 370 375 380
 Thr Glu Ser Ser Ala Pro Ala Met Glu Ser Phe Thr Glu Leu Val Gly
 385 390 395 400
 Gly Ile Ala Ser Gly Glu Asp Ala Leu Thr Gly Ser Thr Glu Leu Val
 405 410 415
 Arg Arg His Ser Arg Gln Thr Ala Glu Leu Gly Gln Ala Val Ala Gly
 420 425 430
 Leu Glu Glu Gly Gly Thr Gly Phe Leu Arg Gly Ser Ser Val Val Ala
 435 440 445
 Gln Ala Met Phe Glu Gly Ser Gln Ile Gln Ala Gly Ala Ile Leu Gly
 450 455 460
 Pro Glu Gly Thr Gln Glu Gln Pro Leu Phe Glu Gly Gly Leu Thr Pro
 465 470 475 480
 Ser Gly Asn Gly Leu Thr Trp Val Ala Ala Asp
 485 490

<210> 22
 <211> 217
 <212> PRT
 <213> Actinoplanes sp.

<400> 22

Met Thr Ile Arg Val Leu Ile Ala Asp Asp Gln Ala Met Ile Arg Ser
 1 5 10 15
 Gly Leu Arg Leu Ile Leu Glu Asp Glu Pro Asp Ile Glu Val Val Ala
 20 25 30
 Glu Ala Val Asp Gly Val Asp Ala Val Ala Gln Ala Arg Lys Leu Arg
 35 40 45
 Pro Asp Val Cys Leu Val Asp Ile Arg Met Pro Arg Ile Asp Gly Ile
 50 55 60
 Glu Val Thr Arg Ser Leu Ala Gly Pro Gly Val Val Asn Pro Leu Arg
 65 70 75 80
 Val Ile Val Val Thr Thr Phe Asp Ser Asp Glu Tyr Val Tyr Gly Ala

85										90					95				
Leu	Arg	Gly	Gly	Ala	Val	Gly	Phe	Ile	Leu	Lys	Asp	Ala	Gly	Pro	Thr				
			100					105					110						
Leu	Leu	Val	Glu	Ala	Val	Arg	Ala	Ala	His	Lys	Gly	Asp	Ala	Leu	Val				
		115					120					125							
Ser	Pro	Ser	Val	Thr	Val	Arg	Leu	Leu	Asn	His	Leu	Asn	Ala	Ser	Ala				
	130					135					140								
Ala	Pro	Ala	Gly	Ser	Glu	Pro	Ile	Pro	Leu	Ser	Asp	Arg	Glu	Leu	Glu				
145					150				155						160				
Val	Ala	Arg	Ala	Ile	Ala	Arg	Gly	Arg	Thr	Asn	Gln	Glu	Ile	Ala	Ala				
				165					170					175					
Asp	Leu	Phe	Ile	Ser	Leu	Ser	Thr	Val	Lys	Gly	His	Ala	Ser	Thr	Ile				
			180					185					190						
Gln	Ser	Lys	Leu	Gly	Val	Arg	Asn	Arg	Val	Gly	Val	Ala	Ala	Trp	Ala				
		195					200					205							
Trp	Glu	Asn	Arg	Leu	Val	Glu	Gly	Ser											
	210					215													
<210>	23																		
<211>	403																		
<212>	PRT																		
<213>	Actinoplanes sp.																		
<400>	23																		
Met	Asn	Ile	Ala	Ala	Ala	Thr	Gly	Pro	Ala	Ala	Gly	Asp	Gly	Ala	Gly				
1				5				10						15					
Ile	Arg	Thr	Leu	Gly	Ser	Val	Arg	Thr	Ala	Asp	Arg	Thr	Thr	Thr	Met				
			20					25					30						
Val	Ala	Asp	Ala	Gly	Leu	Ala	Val	Leu	Phe	Val	Ala	Ala	Val	Val	Val				
		35					40					45							
Glu	Ala	Val	Ala	Val	Ala	Gln	Ser	Trp	Gly	Leu	Ala	Tyr	Trp	Leu	Ile				
	50					55					60								
Gly	Gly	Ala	Ala	Ala	Thr	Leu	Val	Cys	Leu	Leu	Ala	Leu	Ile	Arg	Arg				
65					70				75					80					
Arg	Gly	Pro	Val	Pro	Cys	Ala	Ala	Ala	Gly	Leu	Thr	Ile	Ala	Ala	Gly				
				85					90					95					
Ala	Val	Val	Thr	Ala	Ala	Val	Leu	His	Met	Pro	Ala	Glu	Pro	Gly	Pro				
			100					105					110						
Ala	Met	Ala	Leu	Ala	Leu	Ala	Val	Leu	Thr	Gly	Ser	Ala	Val	Arg	Ala				
		115						120				125							
Ala	Pro	Thr	Ile	Pro	Ala	Phe	Ala	Val	Gly	Gly	Ala	Ala	Leu	Gly	Val				
	130					135						140							

Val Ala Leu Ser Gln Val Ala Ala Ala Thr Trp Asp Ala Gly Pro Ala
 145 150 155 160
 Pro Val Thr Trp Leu Asn Ile Leu Thr Trp Leu Gly Gly Thr Ala Thr
 165 170 175
 Gly Leu Ser Leu Arg Thr Val Asp Gly Arg Ala Arg Ala Asn Ala Glu
 180 185 190
 Arg Ile Arg Gln Glu Glu Arg Leu Glu Leu Ala Arg Glu Leu His Asp
 195 200 205
 Val Val Ala His His Ile Thr Gly Met Ile Leu Gln Thr Gln Ala Ala
 210 215 220
 Gln Val Leu Ala Arg Arg Asp Ala Gly Arg Val Pro Glu Arg Leu Ala
 225 230 235 240
 Val Ile Glu Thr Ala Gly Thr Glu Ala Leu Ala Ala Met Arg Arg Val
 245 250 255
 Val Gly Leu Leu Arg Asp Ala Asp Asp Gly Pro Pro Ser Ala Pro Glu
 260 265 270
 Pro Glu Glu Leu Ser Thr Leu Val Glu Arg Phe Ser Arg Gln Gly Gly
 275 280 285
 Pro Val Arg Leu Thr Thr Pro Asp Gly Met Lys Gln Trp Pro Ile Glu
 290 295 300
 Val Thr Thr Thr Val Tyr Arg Ile Val Arg Glu Ala Leu Thr Asn Val
 305 310 315 320
 Ala Arg His Ala Pro His Ala Pro Asn Val Thr Val Thr Val Thr Val
 325 330 335
 Glu Gln Ala Asp Glu Ile Arg Val Glu Val Thr Asn Asp Ala Ala Ala
 340 345 350
 Ala Pro Pro Arg Leu His His Arg Gly Gly Tyr Gly Leu Val Gly Met
 355 360 365
 Arg Glu Arg Val Glu Ser Leu Gly Gly Thr Leu Ser Thr Gly Pro Arg
 370 375 380
 Pro Gly Gly Gly Trp Ser Val Ala Ala Thr Leu Pro Asn Pro Pro Arg
 385 390 395 400
 Glu Arg Arg

<210> 24
 <211> 309
 <212> PRT
 <213> Actinoplanes sp.

<400> 24

Met Lys Ala Met Ser His Glu Arg Ser Thr Pro Val Leu Gln Ala Glu
 1 5 10 15

Gly Leu Thr Lys Arg Tyr Gly Arg Arg Arg Ala Leu Thr Asp Cys Thr
 20 25 30
 Leu Ser Val Pro Ser Gly Arg Val Ile Ala Leu Val Gly Pro Arg Gly
 35 40 45
 Ser Gly Lys Ser Thr Leu Leu Gln Leu Cys Cys Gly Met Val Ala Pro
 50 55 60
 Ser Arg Gly Arg Ile Arg Val Leu Gly Glu Arg Pro Asp Ala Gly Ala
 65 70 75 80
 Ala His Leu Ala Arg Val Gly Tyr Val Pro Arg Glu Pro Ala Val Tyr
 85 90 95
 Gly Ser Phe Thr Val Glu Asp His Leu Thr Met Gly Ala Arg Leu Asn
 100 105 110
 Pro Arg Trp Asp Arg Arg Leu Ala Asp Arg Arg Ile Ala Ser Ala Gly
 115 120 125
 Ile Pro Arg Thr Arg Arg Ala Asp Arg Leu Ser Ala Gly Gln Arg Ala
 130 135 140
 Glu Leu Ala Leu Thr Leu Ala Gly Gly Lys Arg Pro Glu Leu Leu Val
 145 150 155 160
 Leu Asp Glu Pro Gly Ala Val Leu Asp Ala Pro Ala Arg Ala Ser Phe
 165 170 175
 Leu Arg Gly Val Leu Asp Phe Val Ala Glu Ile Asp Ala Ser Val Leu
 180 185 190
 Ile Ser Gly His Pro Ser Gly Glu Val Glu Arg Leu Cys Asp His Leu
 195 200 205
 Ile Val Leu Ser Asp Ser Arg Val Leu Val Ala Gly Asp Val Arg Asp
 210 215 220
 Leu Leu Ala Arg His His Arg Ile Ile Ala Pro Arg Gly Glu Leu Asp
 225 230 235 240
 Arg Leu Pro Pro Gly Met Glu Pro Ile Trp Val Glu Asp Phe Gly Ser
 245 250 255
 Tyr Ser Gly Gly Val Val Arg Ala Glu Val Asp Leu Pro Arg Arg Pro
 260 265 270
 Trp Thr Val Glu Arg Val Glu Leu Glu Glu Leu Val Leu Ser Tyr Leu
 275 280 285
 Ser Arg Ala Ser Gly Ala Pro Ala Leu Ala Gly Cys Leu Ile Ala Pro
 290 295 300
 Gly Gln Pro Gly Ser
 305

<210> 25
 <211> 553

Val Arg Leu Ala Thr Glu Met Ala Met Glu Arg Arg Leu Tyr Gly Ala
260 265 270
Ala Val Ala Asp Leu Pro Tyr Val Arg Thr Thr Ile Ala Arg Ala Tyr
275 280 285
Ala Ala Leu Leu Thr Val Asp Val Phe Ser Gly Val Gly Leu Arg Ala
290 295 300
Leu His Leu Leu Pro Glu Ala Thr Ala Gly Tyr Ala Pro Ala Val Lys
305 310 315 320
Tyr Leu Thr Ala Gln Ile Val Leu Asp Ala Ile Asp Asp Leu Arg Ser
325 330 335
Val Leu Gly Ala Gln Gly Tyr Leu Arg Gln Gly Pro Tyr Ala Met Phe
340 345 350
Gln Lys Leu Val Arg Asp Ala Ala Pro Ala Ser Phe Ala His Val Ser
355 360 365
Arg Ala Ala Cys Leu Val Met Leu Leu Pro His Leu Pro Arg Leu Ala
370 375 380
Arg Arg Ser Trp Thr Ala Glu Glu Pro Pro Pro Asp Asn Val Phe Thr
385 390 395 400
Leu Gly Gly Glu Leu Ser Pro Leu Asp Phe Ser Arg Leu Val Ser Gly
405 410 415
Met Arg Gly Asp Pro Leu Ala Gly Val Leu His Asp Ser Trp His Asp
420 425 430
Glu Gly Pro Val Gly Arg Phe Ala Glu Arg Phe His Arg Glu Leu Thr
435 440 445
Gly Leu Arg Asp Ala Cys Arg Glu Leu Gly Pro Ala Asp Ile Thr Ile
450 455 460
Asp Ala Asn Pro Ala Ala Phe Ala Leu Ala Asp Arg Tyr Thr Val Leu
465 470 475 480
Leu Ala Ala Ala Cys Ala Leu Gly Val Trp Arg Ala Gly Gly Arg Leu
485 490 495
His Arg Pro Ala Leu Leu Ala Val Leu Asp Gly Leu Ala Gly Arg Leu
500 505 510
Gly Gly Glu Ala Val Leu Ser Val Ala Glu Arg Glu His Val Glu His
515 520 525
Gln Leu Phe Glu Met Ala Ala Asp Arg Val Arg Thr Ser Arg Leu Leu
530 535 540
Asp Leu Ser Ala Arg Gln Leu Pro Gly
545 550

<210> 26
<211> 585

<212> PRT
 <213> Actinoplanes sp.

<400> 26

Met	Thr	Val	Arg	Pro	Leu	Ala	Pro	Pro	Ala	Glu	Val	Arg	Leu	Asp	Asp	1	5	10	15
Leu	Leu	Gly	Pro	Glu	Asp	Ala	Trp	Asp	Ala	Glu	Thr	Ala	Ala	Arg	Asp	20	25	30	
Ile	Ala	Glu	Glu	Phe	Pro	Ala	Arg	Leu	His	Asp	Arg	Leu	Asn	Ser	Phe	35	40	45	
Gly	Leu	Gln	Ser	Trp	Tyr	Val	Pro	Pro	Glu	Trp	Gly	Gly	Ala	Pro	Gly	50	55	60	
Asp	His	Glu	Arg	Leu	Leu	His	Leu	Trp	Arg	Ala	Val	Ala	Arg	Arg	Asp	65	70	75	80
Leu	Ser	Ala	Ala	Val	Ala	His	Gly	Lys	Thr	Tyr	Leu	Gly	Ser	Ala	Pro	85	90	95	
Val	Trp	Leu	Ala	Gly	Asp	Asp	Gly	Gln	Arg	Ala	Thr	Leu	Ala	Ala	Ala	100	105	110	
Val	Leu	Ala	Gly	Thr	Pro	Val	Ala	Trp	Ala	Leu	Ser	Glu	Pro	Asp	His	115	120	125	
Gly	Ala	Asp	Leu	Leu	His	Gly	Thr	Thr	Thr	Ala	Leu	Pro	His	Asp	Ala	130	135	140	
Gly	Tyr	Arg	Leu	Arg	Gly	Leu	Lys	Trp	Pro	Ile	Asn	Asn	Ala	Thr	Arg	145	150	155	160
Ala	Arg	Tyr	Leu	Thr	Val	Leu	Ala	Arg	Thr	Gly	Arg	Ala	Gly	Asp	Ala	165	170	175	
Arg	Gly	Gln	Ser	Leu	Phe	Leu	Val	Asp	Lys	Glu	Ala	Leu	Ala	Pro	Gly	180	185	190	
Thr	Trp	Leu	Pro	Arg	Pro	Lys	Val	Ala	Thr	His	Gly	Val	Arg	Gly	Ile	195	200	205	
Asp	Ile	Ser	Gly	Ile	Ala	Phe	Glu	Asp	Ala	Gly	Leu	Pro	Gly	Thr	Ala	210	215	220	
Leu	Leu	Gly	Arg	Ala	Gly	Ser	Gly	Leu	Glu	Thr	Val	Leu	Arg	Ser	Leu	225	230	235	240
Gln	Leu	Thr	Arg	Thr	Met	Cys	Ala	Gly	Leu	Ser	Leu	Gly	Ala	Gly	Asp	245	250	255	
Arg	Ala	Leu	Arg	Leu	Thr	Ala	Arg	Phe	Val	Ala	Gln	Arg	Met	Ile	Met	260	265	270	
Arg	Arg	Pro	Leu	Leu	Asp	Arg	Gly	His	Pro	Ala	Gly	Ile	Leu	Ala	Arg	275	280	285	
Cys	Ala	Ala	Leu	Leu	Ala	Ala	Ala	Glu	Ala	Thr	Ala	Val	Val	Gly	Thr				

290					295					300					
Arg	Ser	Val	His	Ser	Leu	Thr	Ala	Glu	Met	Ser	Val	Thr	Ser	Ala	Ile
305					310					315					320
Val	Lys	Ala	Tyr	Val	Pro	Thr	Val	Val	Asp	Arg	Val	Leu	Arg	Glu	Leu
				325					330					335	
Ala	Glu	Leu	Leu	Gly	Ser	Arg	Ser	Phe	Leu	Arg	Asp	Glu	Tyr	Glu	His
			340					345					350		
Gly	Met	Phe	Pro	Lys	Leu	Val	Arg	Asp	His	His	Val	Val	Ala	Val	Phe
		355					360					365			
Asp	Gly	Ser	Thr	Pro	Val	Val	Arg	Thr	Ala	Leu	Ala	His	Gln	Phe	Pro
	370					375					380				
Arg	Leu	Ala	Ala	Gly	Phe	Ala	Ala	Gly	Ala	Val	Ser	Ala	Glu	Gly	Leu
385					390					395					400
Ala	Glu	Ala	Ser	Ala	Ala	Gly	Gln	Pro	Pro	Pro	Pro	Leu	Asp	Arg	Gly
			405					410						415	
Ala	Leu	Thr	Leu	Leu	Ser	Arg	His	Gly	Cys	Ser	Val	Val	Gln	Ala	Leu
			420					425					430		
Pro	Ala	Leu	Ala	Val	Ser	Ala	Ala	Val	Arg	Gly	Gly	Pro	Ala	Gly	Leu
		435				440						445			
Ala	Arg	His	Ala	Ala	Ala	Leu	Ala	Gly	Glu	Ala	Arg	Arg	Ile	Cys	Gly
	450					455					460				
Gln	Met	Thr	Glu	Leu	Gly	Pro	Ser	Ala	Arg	Pro	Ser	Met	Val	Gly	His
465					470					475					480
Glu	Leu	Ala	Ala	Ala	Tyr	Glu	Trp	Cys	Tyr	Ala	Gly	Ala	Ala	Cys	Leu
			485					490						495	
Leu	Leu	Trp	Thr	Ser	Ala	Glu	Gly	Arg	His	Thr	Ala	Asp	Pro	Leu	Trp
			500					505					510		
Ala	Asp	Gly	Leu	Trp	Val	Leu	Ala	Ala	Leu	Arg	Ala	Val	Arg	Arg	Glu
		515					520					525			
Leu	Ala	Arg	Val	Leu	Arg	Ala	Pro	Ala	Pro	Asp	Pro	Gly	Pro	His	Asp
		530				535					540				
Asp	Gly	Ala	Asp	Arg	Leu	Leu	Ala	Ala	Arg	Val	Ala	Ala	Ala	Ala	Arg
545					550					555					560
Thr	Gly	Glu	Pro	Val	Thr	Pro	Phe	Gly	Thr	Ala	Leu	Arg	Pro	Pro	Ala
				565					570					575	
Gly	Thr	Val	Arg	Ala	Glu	Asp	Gly	Arg							
			580					585							

<210> 27
 <211> 587
 <212> PRT
 <213> Actinoplanes sp.

<400> 27

Met	Val	Ile	Asp	Ala	Ala	Thr	Gln	Pro	Thr	Val	Pro	Asp	Ala	Phe	Arg	1	5	10	15
Ala	Gln	Ala	Ile	Ala	Arg	Pro	Gly	Glu	Pro	Ala	Leu	Val	Val	Leu	Pro	20	25	30	
Gly	Asp	Pro	Asp	Ala	Glu	Pro	Val	Thr	Leu	Thr	Tyr	Ala	Glu	Leu	Asp	35	40	45	
Arg	Arg	Ala	Ala	Ala	Arg	Ala	Ala	Trp	Leu	Ala	Ala	Arg	Phe	Pro	Ala	50	55	60	
Gly	Glu	Arg	Ile	Leu	Ile	Ala	Leu	Pro	Thr	Gly	Ala	Glu	Phe	Val	Glu	65	70	75	
Leu	Tyr	Leu	Ala	Cys	Leu	Tyr	Ala	Gly	Leu	Val	Ala	Val	Pro	Ala	Pro	85	90	95	
Pro	Pro	Gly	Gly	Ser	Ser	Gly	Ala	Ser	Glu	Arg	Thr	Val	Gly	Ile	Ala	100	105	110	
Ala	Asp	Cys	Ser	Pro	Ala	Leu	Ala	Val	Val	Asn	Ala	Asp	Asp	Ala	Ala	115	120	125	
Pro	Leu	Thr	Ala	Val	Leu	Arg	Glu	Arg	Gly	Leu	Ser	Gly	Leu	Pro	Val	130	135	140	
Gly	Ala	Leu	Pro	Pro	Leu	Ala	Ala	Glu	Ala	Ile	Arg	Pro	Pro	Arg	Gly	145	150	155	
Pro	Arg	Pro	Asp	Ser	Leu	Ala	Val	Leu	Gln	Tyr	Ser	Ser	Gly	Ser	Thr	165	170	175	
Gly	Ser	Pro	Lys	Gly	Val	Met	Leu	Ser	His	Arg	Ala	Val	Leu	Ala	Asn	180	185	190	
Leu	Arg	Ala	Phe	Asp	Arg	Ser	Ser	Gly	His	Asn	Ser	Asp	Asp	Val	Phe	195	200	205	
Gly	Ser	Trp	Leu	Pro	Leu	His	His	Asp	Met	Gly	Leu	Phe	Ala	Met	Leu	210	215	220	
Thr	Ala	Gly	Leu	Leu	Asn	Gly	Ala	Gly	Val	Val	Leu	Met	Ser	Pro	Thr	225	230	235	
Ala	Phe	Val	Arg	Arg	Pro	Ala	Asp	Trp	Leu	Arg	Met	Met	Asp	Arg	Tyr	245	250	255	
Arg	Val	Thr	Ile	Ser	Ala	Ala	Pro	Asn	Phe	Ala	Tyr	Asp	Leu	Cys	Val	260	265	270	
Arg	Ala	Val	Arg	Asp	Glu	Gln	Ile	Ala	Gly	Leu	Asp	Leu	Ser	Arg	Ile	275	280	285	
Arg	Thr	Leu	Tyr	Asn	Gly	Ser	Glu	Pro	Val	Asn	Pro	Ala	Thr	Val	Arg	290	295	300	

Ala Phe Thr Glu Arg Phe Ala Pro Phe Gly Leu His Thr His Ala Val
 305 310 315 320
 Asn Pro Cys Tyr Gly Met Ala Glu Phe Thr Ala Tyr Val Ser Thr Lys
 325 330 335
 Val Phe Glu Ala Pro Ala Val Phe Leu Pro Ala Asp Pro Arg Ala Leu
 340 345 350
 Glu Asp Ala Ala Ser Pro Ala Leu Arg Pro Ala Asp Pro Ala Ala Ala
 355 360 365
 Arg Glu Ile Pro Gly Val Gly Arg Val Pro Asp Phe Glu Val Leu Ile
 370 375 380
 Val Asp Pro Asp Gly Leu Arg Pro Leu Pro Glu Gly Arg Val Gly Glu
 385 390 395 400
 Ile Trp Leu Arg Gly Pro Gly Ala Gly Ala Gly Tyr Trp Gly Arg Thr
 405 410 415
 Glu Leu Asn Pro Gly Ile Phe Asp Ala Arg Pro Ala Gly Asp Gly Gln
 420 425 430
 Asp Gly Gly Trp Val Arg Thr Gly Asp Leu Gly Ala Leu Thr Gly Gly
 435 440 445
 Glu Leu Phe Leu Thr Gly Arg Leu Lys Glu Leu Leu Ile Val His Gly
 450 455 460
 Arg Asn Leu Ala Pro His Asp Leu Glu Arg Glu Ala Arg Ala Ala His
 465 470 475 480
 Asp Ala Val Asp His Gln Ile Gly Ala Ala Phe Gly Val Pro Ala Pro
 485 490 495
 Asp Glu Arg Ile Val Leu Val Gln Glu Val His Pro Arg Thr Pro Leu
 500 505 510
 Asp Glu Leu Pro Arg Val Ala Ser Ala Val Ser Arg Arg Leu Thr Val
 515 520 525
 Ser Phe Gly Val Pro Val Arg Asn Val Leu Leu Val Arg Arg Gly Thr
 530 535 540
 Val Arg Arg Thr Thr Ser Gly Lys Ile Arg Arg Thr Ala Val Arg Glu
 545 550 555 560
 Arg Phe Leu Ala Gly Gly Ile Thr Ala Leu His Ala Glu Leu Glu Pro
 565 570 575
 Ala Leu Arg Pro Val Gln Ala Gly Ala Gly Arg
 580 585

<210> 28
 <211> 75
 <212> PRT
 <213> Actinoplanes sp.

<220>

<221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. Ti is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 28

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Val Pro Asn Pro Phe Glu Asp Pro Asp Ala Asn Tyr Leu Val Leu Val
1          5          10          15
Asn Asp Glu Gly Gln His Ser Leu Trp Pro Val Phe Ala Asp Val Pro
          20          25          30
Asp Gly Trp Thr Thr Val Phe Gly Glu Ala Gly Arg Gln Asp Cys Leu
          35          40          45
Asp Tyr Ile Glu Lys Ser Trp Thr Asp Met Arg Pro Lys Ser Leu Ile
          50          55          60
Ala Ala Met Glu Lys Gln Lys Gln Pro Gln Ser
65          70          75

```

<210> 29
 <211> 94
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V is a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 29

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Val Ala Pro Gly Ala Pro Pro Ala Glu His Gly Glu Ala Val Pro Glu
1          5          10          15
Ala Asp Ile Pro Val Leu Arg Asn Arg Ile Asp Glu Ile Asp Ala Ala
          20          25          30
Ile Met Arg Leu Trp Gln Glu Arg Ala Ser Ile Ser Gln Lys Ile Gly
          35          40          45
Ser Ile Arg Leu Ala Ser Gly Gly Thr Arg Val Val Leu Ser Arg Glu
          50          55          60
Gln Glu Val Ile Gln Arg Phe Arg Ala Ala Leu Gly Glu Asp Gly Thr
65          70          75          80
Thr Ile Ala Leu Met Leu Leu Arg Ala Gly Arg Gly Pro Leu
          85          90

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<210> 30
 <211> 619
 <212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 30

Val	Asp	Val	Pro	Arg	Val	Arg	Pro	Pro	Gly	Ala	Ala	Pro	Ala	Pro	Arg	
1				5					10					15		
Arg	Arg	Arg	Trp	Arg	Phe	Trp	Gln	Ser	Pro	Asp	Gly	Gln	Pro	Ala	Trp	
			20					25					30			
Ala	Arg	Pro	Ala	Leu	Leu	Gly	Ile	Ala	Ala	Leu	Ala	Ala	Val	Leu	Tyr	
		35					40					45				
Thr	Ala	Asn	Leu	Ala	Arg	Ser	Gly	Tyr	Pro	Met	Tyr	Tyr	Ala	Val	Ala	
	50					55					60					
Val	Lys	Ser	Met	Ser	Val	Ser	Trp	Pro	Ala	Phe	Trp	Thr	Gly	Ala	Phe	
65					70					75					80	
Asp	Pro	Ala	Ala	Ser	Ile	Thr	Ile	Asp	Lys	Leu	Ala	Gly	Ala	Phe	Val	
				85					90					95		
Pro	Gln	Ala	Leu	Ser	Ala	Arg	Val	Phe	Gly	Phe	His	Gln	Trp	Ser	Leu	
			100					105					110			
Ala	Leu	Pro	Gln	Ala	Val	Glu	Gly	Val	Ile	Ala	Val	Leu	Val	Leu	Tyr	
		115					120					125				
Arg	Ala	Val	Arg	Arg	Trp	His	Gly	Pro	Gly	Ala	Gly	Leu	Ala	Ala	Ala	
	130					135					140					
Gly	Leu	Phe	Ala	Thr	Thr	Pro	Ile	Val	Ser	Ser	Met	Phe	Gly	His	Ser	
145					150					155					160	
Met	Glu	Asp	Gly	Ala	Leu	Thr	Leu	Cys	Leu	Val	Leu	Ala	Ala	Asp	Ala	
			165					170						175		
Phe	Gly	Ala	Ala	Val	Thr	Arg	Gly	Ser	Pro	Ala	Arg	Leu	Ala	Leu	Ala	
			180					185					190			
Gly	Ala	Trp	Ile	Gly	Leu	Gly	Phe	Gln	Ala	Lys	Met	Met	Gln	Ala	Trp	
		195					200					205				
Leu	Val	Leu	Pro	Ala	Leu	Val	Val	Thr	Tyr	Leu	Ala	Gly	Ala	Pro	Val	
	210					215					220					
Arg	Ala	Arg	Ala	Arg	Val	Val	His	Val	Ala	Ala	Ala	Val	Ala	Ala	Thr	
225					230					235					240	
Leu	Ala	Val	Ser	Leu	Leu	Trp	Val	Leu	Ala	Leu	Thr	Leu	Leu	Pro	Gly	
				245					250					255		

Ser His Arg Pro Trp Ala Asp Gly Thr Thr Ser Gly Asn Ala Phe Ala
 260 265 270
 Met Val Phe Gly Tyr Asn Gly Phe Asp Arg Ala Gly Ile His Val Pro
 275 280 285
 Gly Ala Leu Thr Thr Gly Phe Thr Asp Gly Gly Ala Ala Ala Gly Gly
 290 295 300
 Ser Trp Thr Ala Leu Ala Ala Asp Arg Leu Ala Thr Gln Ile Gly Trp
 305 310 315 320
 Trp Tyr Pro Leu Ala Leu Thr Gly Leu Leu Leu Gly Leu Ala Arg Trp
 325 330 335
 Arg Thr Ala Arg Ala Gly Leu Leu Phe Trp Gly Leu Trp Leu Leu Thr
 340 345 350
 Ala Ala Val Val Leu Ser Arg Ile Thr Ile Gln His Asn Ala Tyr Leu
 355 360 365
 Ala Val Leu Ala Pro Pro Leu Ala Ala Leu Ala Ala Ala Gly Ala Val
 370 375 380
 Gln Leu Trp Arg Thr His Arg Asp Gly Thr Ala Pro Trp Leu Leu Pro
 385 390 395 400
 Ala Val Val Val Val Gln Ala Gly Trp Thr Leu Trp Leu Ala Thr Arg
 405 410 415
 Tyr Pro Ser Phe Leu Ala Gly Leu Thr Trp Thr Ala Pro Ile Ala Ala
 420 425 430
 Val Leu Ala Val Val Val Leu Ala Ala Arg Pro Thr Ala Arg Arg Pro
 435 440 445
 Ala Val Val Val Val Val Ala Gly Leu Leu Ala Val Pro Val Ala Trp
 450 455 460
 Gly Ala Ser Val Leu Asn Pro Arg Tyr Ala Gly Thr Ser Phe Glu Ala
 465 470 475 480
 Gly Ala Gly Pro Ser Gly Pro Val Gly Val Arg Leu Asp Asp Asp Thr
 485 490 495
 Thr Asp Arg Leu Thr Pro Gly Leu Arg Arg Leu Asp Asp Tyr Leu Ala
 500 505 510
 Ala His Arg Asp Gly Arg Thr Tyr Leu Ala Ala Thr Ser Ser Trp Arg
 515 520 525
 Thr Ala Gly Arg Leu Ile Val Pro Thr Gly His Ser Tyr Leu Pro Leu
 530 535 540
 Gly Gly Phe Ser Gly Ala Ala Pro Phe Pro Ser Leu Ala Gly Val Gln
 545 550 555 560
 Arg Leu Val Arg Asp Gly Glu Leu Arg Tyr Phe Val Leu Gly Gly Pro
 565 570 575

Glu Gly Leu Gly Gly Glu Ala Thr Glu Ala Tyr Arg Ile Thr Gly Trp
 580 585 590

Val Leu Glu Thr Cys Ala Thr Val Pro Pro Ala Glu His Gly Ala Asp
 595 600 605

Pro Asp Leu Thr Val Leu Arg Cys Asp Lys Pro
 610 615

<210> 31
 <211> 355
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue a
 t this position

<400> 31

Val Asp Asn Gly Thr Phe Thr Asp Leu Arg Ile Asp His Ile Glu Phe
 1 5 10 15

Ala Val Ala Asp Val Glu Ser Ala Ser Ala Pro Phe Thr Glu Gly Tyr
 20 25 30

Gly Phe Ser Val Tyr Gly Gly Thr Gly Asp Ala His Ala Pro Val Arg
 35 40 45

Arg Val Ala Leu Gly Arg Asp Asp Ile Arg Leu Val Leu Thr Ala Ala
 50 55 60

Pro Gly Gly Asp His Pro Ala Met Ala Tyr Val Glu Gln His Gly Asp
 65 70 75 80

Gly Val Ser Ala Ile Ala Leu Ser Thr Arg Asp Ala His Ala Ala Phe
 85 90 95

Thr Glu Ala Val Arg Arg Gly Ala Val Gly Val Ser Ala Pro Val Thr
 100 105 110

Gly Asn Gly Val Thr Val Ala Thr Ile Arg Gly Phe Gly Asp Val Leu
 115 120 125

His Thr Phe Val Glu Arg Ala Pro Gly Ala Asp Pro Arg Thr Leu Pro
 130 135 140

Gly Leu Glu Leu Arg Arg Pro Ser Pro Thr Arg Phe Asp Ser Gly Leu
 145 150 155 160

Gln Ala Ile Asp His Ile Ala Val Cys Leu Glu Pro Gly Thr Leu Asp
 165 170 175

Pro Thr Val Asp Phe Tyr Arg Asp Val Leu Asp Phe Glu Met Ile Phe
 180 185 190

Glu Glu Arg Ile Leu Val Gly Arg Gln Ala Met Asp Ser Lys Val Val
 195 200 205
 Gln Ser Arg Ser Gly Gly Val Thr Leu Thr Leu Ile Glu Pro Asp Thr
 210 215 220
 Ser Leu Glu Gln Gly Gln Ile Asp Thr Phe Leu Lys Asn His Gly Gly
 225 230 235 240
 Pro Gly Val Gln His Leu Ala Phe Ile Thr Asp Asp Val Leu Arg Ser
 245 250 255
 Val Gly Arg Met Ser Glu His Gly Val Glu Phe Leu His Thr Pro Asp
 260 265 270
 Ser Tyr Tyr Gly Arg Leu Pro Gly Arg Ile Pro Gln Ala Gly His Pro
 275 280 285
 Ile Gln Ala Leu Arg Asp Leu Asn Val Leu Val Asp Gln Asp His Asp
 290 295 300
 Gly Gln Leu Phe Gln Ile Phe Thr Lys Ser Val His Pro Arg Gly Thr
 305 310 315 320
 Ile Phe Met Glu Val Ile Glu Arg Met Gly Ala Arg Ser Phe Gly Ser
 325 330 335
 Gly Asn Ile Lys Ala Leu Tyr Glu Ala Val Glu Leu Asp Met Ser Lys
 340 345 350
 Gln Ser Ala
 355
 <210> 32
 <211> 429
 <212> PRT
 <213> Actinoplanes sp.
 <400> 32
 Met Glu Ser Pro Ala Thr His Ala Glu Leu Val Ile Gly Thr Val Leu
 1 5 10 15
 Leu Asp Ile Ala Leu Val Leu Ala Ala Gly Ala Leu Leu Gly Arg Trp
 20 25 30
 Val Arg Arg Leu Arg Gln Pro Ala Val Ile Gly Glu Ile Leu Ala Gly
 35 40 45
 Ile Ala Leu Gly Pro Ser Leu Leu Gly Leu Leu Pro Gly Asn Pro Thr
 50 55 60
 Ala Trp Leu Phe Pro Ala Glu Ala Arg Pro Tyr Leu Ser Ala Val Ala
 65 70 75 80
 Gln Ile Gly Leu Ala Leu Phe Thr Phe Leu Ile Gly Trp Glu Phe Asn
 85 90 95
 Pro Ala Thr Leu Ala Arg His Arg Gly Thr Ala Ala Ala Val Ser Ile
 100 105 110

Gly	Ser	Ile	Ala	Val	Ser	Phe	Gly	Leu	Gly	Ile	Ala	Leu	Ala	Thr	Val		
		115					120					125					
Leu	His	Pro	Arg	His	Asp	Thr	Thr	Gly	Gly	Gly	Lys	Val	Gly	Phe	Thr		
	130					135					140						
Glu	Phe	Ala	Leu	Phe	Leu	Gly	Val	Ala	Met	Ser	Ile	Thr	Ala	Phe	Pro		
145					150					155					160		
Val	Leu	Ala	Arg	Ile	Leu	Ala	Glu	Arg	Arg	Leu	Thr	Gly	Thr	Arg	Val		
				165					170						175		
Gly	Ser	Ile	Ala	Leu	Val	Ser	Ala	Ala	Ile	Asp	Asp	Val	Val	Ala	Trp		
			180					185					190				
Cys	Leu	Leu	Ala	Leu	Val	Thr	Ala	Ile	Ala	Thr	Ala	Ser	Gly	Pro	Val		
	195						200					205					
Gln	Leu	Val	Arg	Ile	Leu	Ala	Leu	Leu	Ala	Val	Phe	Leu	Val	Val	Leu		
	210					215					220						
Val	Thr	Val	Val	Arg	Pro	Leu	Leu	Val	Leu	Leu	Ala	Arg	Arg	Pro	Ser		
225					230					235					240		
Ala	Ser	Tyr	Leu	Leu	Val	Ala	Val	Val	Ala	Val	Val	Leu	Leu	Ser	Ala		
			245						250					255			
Tyr	Ala	Thr	Thr	Trp	Ile	Gly	Leu	His	Ala	Ile	Phe	Gly	Ala	Phe	Cys		
			260					265					270				
Ala	Gly	Leu	Val	Met	Pro	Arg	Glu	Pro	Ala	Ala	Ala	Leu	Arg	Glu	Arg		
	275						280					285					
Val	Arg	Gln	Pro	Leu	Glu	His	Val	Ser	Val	Val	Leu	Leu	Pro	Val	Phe		
	290					295					300						
Phe	Ile	Val	Thr	Gly	Leu	Gly	Val	Asp	Ile	Gly	Ala	Leu	Thr	Ala	Ala		
305					310					315					320		
Asn	Ile	Leu	Glu	Leu	Ala	Ala	Ile	Ile	Val	Ile	Ala	Cys	Ala	Gly	Lys		
			325						330				335				
Leu	Ala	Gly	Ala	Ile	Val	Pro	Ala	Val	Ser	Leu	Gly	Met	Ser	Trp	Arg		
		340						345					350				
Asp	Ala	Arg	Thr	Leu	Gly	Leu	Leu	Val	Asn	Thr	Arg	Gly	Leu	Thr	Glu		
	355						360					365					
Leu	Val	Val	Leu	Asn	Val	Gly	Leu	Gln	Leu	Ala	Val	Leu	Asp	Gly	Gln		
	370					375					380						
Met	Phe	Thr	Met	Met	Val	Leu	Met	Ala	Leu	Val	Thr	Thr	Ala	Leu	Ala		
385					390					395					400		
Gly	Pro	Leu	Ile	Gly	Ser	Ala	Arg	Thr	Pro	Ala	Ala	Gly	Ala	Pro	Ala		
			405						410					415			
Gln	Ala	Leu	Pro	Ala	Glu	Pro	Arg	Thr	Arg	Arg	Ala	Ala					
		420						425									

<210> 33
 <211> 189
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 33

Val	Ser	Asp	Glu	Ala	Ala	Val	Pro	Ser	Pro	Ala	Arg	Leu	Leu	Arg	Asp	1	5	10	15
Phe	Val	Asn	Thr	Tyr	Glu	Pro	Gln	Val	Asp	Asp	Glu	Ser	Leu	Ser	Thr	20	25	30	
Pro	Asp	Ala	Leu	Arg	Ala	Trp	Leu	Ala	Gly	Glu	Ser	Leu	Leu	Ala	Pro	35	40	45	
Gly	Ala	Arg	Val	Arg	Pro	Ala	Asp	Leu	Ala	Arg	Ala	Val	Ala	Leu	Arg	50	55	60	
Glu	Gly	Leu	Arg	Gln	Val	Leu	Leu	Gly	His	Ala	Gly	His	Pro	Ala	Asp	65	70	75	80
Pro	Ala	Ala	Leu	Arg	Arg	Leu	Glu	Glu	Ile	Leu	Ala	Ala	Val	Pro	Val	85	90	95	
Arg	Leu	Ser	Leu	Ala	Gly	Gly	Ala	Pro	Arg	Leu	Leu	Pro	Ala	Gly	Gly	100	105	110	
Thr	Pro	Phe	Asp	Arg	Ala	Leu	Ala	Gly	Leu	Ile	Asp	Ala	Val	Arg	Gln	115	120	125	
Cys	Ala	Glu	Leu	Gln	Val	Trp	Thr	Arg	Leu	Lys	Val	Cys	Asp	Arg	Asp	130	135	140	
Thr	Cys	Arg	Trp	Ala	Tyr	Tyr	Asp	Ala	Ser	Arg	Asn	Gln	Ala	Arg	Arg	145	150	155	160
Trp	Cys	Ser	Met	Ala	Gly	Cys	Gly	Asn	Tyr	Ile	Lys	Met	Arg	Arg	Ala	165	170	175	
Tyr	Ala	Ala	Arg	Arg	Val	Arg	Gly	Ser	Ala	Gly	Ser	Ala	180	185					

<210> 34
 <211> 309
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 34

Val	Ala	Thr	Thr	Leu	Arg	Asp	Val	Ala	Arg	Leu	Ala	Arg	Val	Ser	Val	1	5	10	15
Lys	Thr	Val	Ser	Asn	Val	Val	Asn	Asp	His	Pro	His	Val	Ser	Asp	Asp	20	25	30	
Val	Arg	Arg	Arg	Val	Glu	Thr	Ala	Ile	Arg	Gln	Leu	Gly	Tyr	Arg	Pro	35	40	45	
Asn	Leu	Val	Ala	Arg	Ala	Leu	Arg	Ser	Gly	Arg	Gly	Ser	Gly	Leu	Leu	50	55	60	
Ala	Leu	Ala	Met	Pro	Gly	Ala	Gly	Ala	Pro	Gln	Ser	Pro	Ala	Leu	Ile	65	70	75	80
Glu	Glu	Ile	Ile	Arg	Arg	Ala	Ala	Pro	Leu	Gly	Phe	Arg	Val	Leu	Ile	85	90	95	
Glu	Pro	Leu	Glu	Ser	Ser	Arg	Pro	Arg	Pro	Pro	Ala	Pro	Gly	Val	Asp	100	105	110	
Ala	Arg	Leu	Leu	Asn	Ala	Glu	Ala	Pro	Ala	Pro	Glu	Leu	Val	Asp	Ala	115	120	125	
Gln	Ala	Ala	Thr	Gly	Thr	Pro	Leu	Val	Leu	Leu	Thr	Gly	Thr	Pro	Asp	130	135	140	
Pro	Arg	Tyr	Asp	Cys	Val	Gly	Pro	Asp	Ala	Ala	Arg	Ala	Ala	Glu	Asp	145	150	155	160
Ala	Val	Asp	His	Leu	Arg	Arg	Leu	Gly	Arg	Arg	Arg	Val	Ala	Thr	Ile	165	170	175	
Gly	Gly	Ser	Leu	Ser	Thr	Gly	Pro	Ala	Gly	Ser	Gly	Ser	Asp	Phe	Gly	180	185	190	
Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	195	200	205	
Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Phe	Gly	Ser	Gly	210	215	220	
Ser	Gly	Phe	Gly	Ser	Gly	Ser	Ala	Glu	Gly	Tyr	Arg	Ala	Ala	Arg	Gln	225	230	235	240
Leu	Leu	Gly	His	Glu	Asp	Arg	Pro	Asp	Ala	Ile	Val	Cys	Gly	Ser	Val	245	250	255	
Arg	Leu	Ala	Val	Gly	Val	Ile	Arg	Ala	Ala	Ala	Asp	Ala	Gly	Leu	Arg	260	265	270	
Val	Pro	Glu	Asp	Val	Ala	Val	Ile	Gly	Ile	Gly	Asp	Gly	Glu	Glu	Gly	275	280	285	

Arg Tyr Thr Arg Pro Ala Leu Thr Thr Val Ala Thr Asp Pro Ala Phe
290 295 300

Ile Ala Gly Lys Ala
305